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VOLUME XXVII. 1961.

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SOUTH AFRICAN BOTANY

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THE JOURNAL OF SOUTH AFRICAN BOTANY.

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A NEW ALOE FROM ETHIOPIA

By G. W. Reynolds.

(With Plates I and II.)

Aloe schelpei Reynolds. Species nova, affinis *A. megalacanthae* Bak., caulibus brevioribus decumbentibus, foliis et dentibus minoribus, inflorescentia breviore 1-ramosa, floribus angustioribus differt.

Planta caulibus decumbentibus usque 50 cm. longis, 5—6 cm. diam. *Folia* 16—20, dense rosulata, lanceolato-attenuata, saepe 45 cm. longa, 10—12 cm. lata, patula et recurvula; supra glauca, interdum maculata, basi levissime concava, superne canaliculata; subtus convexa; marginibus dentibus rubris 2—3 mm. longis, 15 mm. distantibus munita.

Inflorescentia simplex vel 1-ramosa, saepe 50 cm. alta. *Racemi* subdensi, 6—9 cm. longi, 6—7 cm. diametro. *Bracteae* ovato-acutae, 5 mm. longae, 3 mm. latae, scariosae, 3—5-nervatae.

Pedicelli 13—15 mm. longi. *Perianthium* aurantiacum, cylindrico-trigonum, 28—30 mm. longum, brevissime stipitatum; *segmenta exteriora* per 12 mm. libera, 3-nervata. *Antherae* 2—3 mm. exsertae. *Stigma* demum 3—4 mm. exserta. *Ovarium* viridulum, 6 mm. longum, 3 mm. diametro. (Plates I—II)

Habitat: Ethiopia, Shoa Prov., Boli Gorge, Mulu Sayu, alt. 7,000 ft., 13 Sept. 1952, Curle et Schelpe 61, holotype (BM); ex Mulu Sayu, cult. Greendale, Salisbury, S. Rhodesia, fl. 10 April 1960, L. C. Leach 9838 (PRE, K).

Our new species is named after Dr. E. A. Schelpe (Dept. of Botany, University of Cape Town), who discovered it in September 1952, on steep grassland slopes of the Boli Gorge, Mulu Sayu, Shoa Province, Ethiopia.

Mulu Sayu is the name of Brigadier D. A. Sandford's farm, lying to the west of the road to the Blue Nile and Debra Marcos, 54 km. north of Addis Ababa.

In May 1956 I visited Mulu Sayu expressly to investigate this species, and found large numbers of plants on steep north-east slopes of the Boli Gorge, facing the 700-ft. waterfall of the Mugur River (a tributary of the Blue Nile), at c. 9° 14′ N., 38° 40′ E., and at an altitude of 7,700 ft. Unfortunately no plants were then in flower, but a description of the available material was prepared. Dry spikes lying about were consistently simple or only 1-branched, and averaged 50 cm. in height.

Three large plants brought back to Johannesburg have shown no sign of flowering in five years, but a plant given to Mr. L. C. Leach, and cultivated by him at Greendale (near Salisbury, S. Rhodesia), flowered there in April 1960. After examining Dr. Schelpe's material in the British Museum, and the flowers of Mr. Leach's specimen, the description can now be completed.

A. schelpei appears to be nearest allied to the Somaliland species *A. megalacantha* Bak. from which it differs chiefly in having much shorter decumbent stems, smaller rosettes and leaves, an inflorescence only 50 cm. in height which is simple or only 1-branched.

The cylindric-conic racemes of *A. schelpei* with the youngest buds spreading horizontally to slightly downwards suggests an affinity with *A. elegans* Tod., but the latter is acaulescent, is not of shrubby growth and has a much taller, very much more branched inflorescence.

Description: *Plant* of low shrubby growth with decumbent stems that are short or up to 50 cm. long, 5—6 cm. thick, with shoots from base or at random along the stem, forming dense groups.

Leaves 16—20, rosulate, lanceolate-attenuate, averaging 45 cm. long, 10—12 cm. broad at base, the youngest erectly spreading, the oldest spreading and recurved; *upper surface* glaucous with bluish tinge, unicoloured or sometimes with several pale green to creamy lenticular spots near base, slightly concave at base, rather deeply canaliculate upwards; *lower surface* rounded, slightly deeper green than upper surface, usually with several spots in lowest quarter; *margins* with prominent reddish pink edge armed with teeth of the same colour at base, paler at apex, firm to subpungent, 2—3 mm. long, about 15 mm. apart. *Sap* dries dark brown.

Inflorescence consistently simple or 1-branched, averaging 50 cm. high, with the peduncle basally plano-convex and 16—18 mm. broad.

Raceme cylindric-conic, 6—9 cm. long, 6—7 cm. diam., rather densely flowered, the youngest buds spreading horizontally to slightly downwards, open flowers nutant to subpendulous.

Bracts ovate-acute, thin, dry, dirty white, 5 mm. long, 3 mm. broad, 3—5-nerved.

Pedicels pink, slender, the lowest 13—15 mm. long.

Perianth orange-red, paler at mouth, 28—30 mm. long, cylindric-trigonous, 7 mm. diam. across the ovary, very slightly narrowed above the ovary on the underside, thence very slightly curved and enlarging trigonously towards the throat and slightly compressed laterally; *outer segments* free for 12 mm., paler and thinner at the margin, 3-nerved, the apices subacute and slightly spreading; *inner segments* broader than the outer and with 3 crowded nerves forming an orange-red keel, the apices brownish and more obtuse than the outer.

Filaments pale yellow, the 3 inner narrower and lengthening before the 3 outer.

Anthers brown, in turn exserted 2—3 mm.

Style greenish yellow, with the *stigma* at length exserted 3—4 mm.

Ovary yellowish green, 6 mm. long, 3 mm. diam.

ACKNOWLEDGMENTS.

I am greatly indebted to:

Dr. E. A. Schelpe, Department of Botany, University of Cape Town, for photographs and data concerning the new species found by him at Mulu Sayu, Ethiopia, and for Aloe plants from elsewhere in Africa.

Mr. J. E. Dandy, Keeper of Botany, British Museum, for sending Dr. Schelpe's specimen to Johannesburg for examination.

Mr. L. C. Leach of Greendale, near Salisbury, S. Rhodesia, for data, photographs in black and white and in colour, and for flowering material.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for the facilities of the National Herbarium, Pretoria, for many photographs, and for much other assistance.

The South African Council for Scientific and Industrial Research for travelling grants that have enabled me to investigate the Aloes in Ethiopia and elsewhere in Africa.

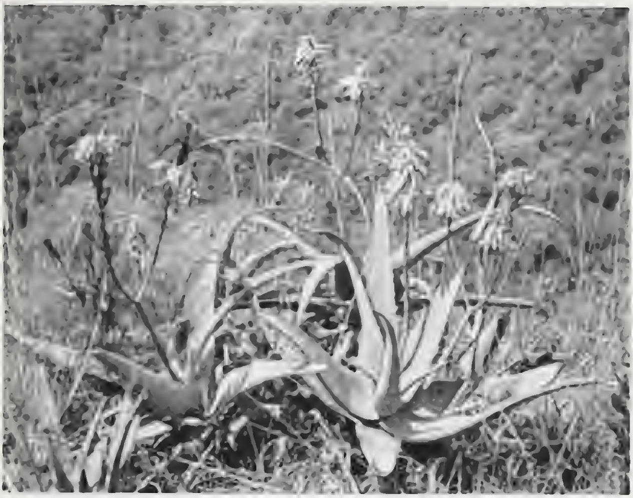

Fig. 1.

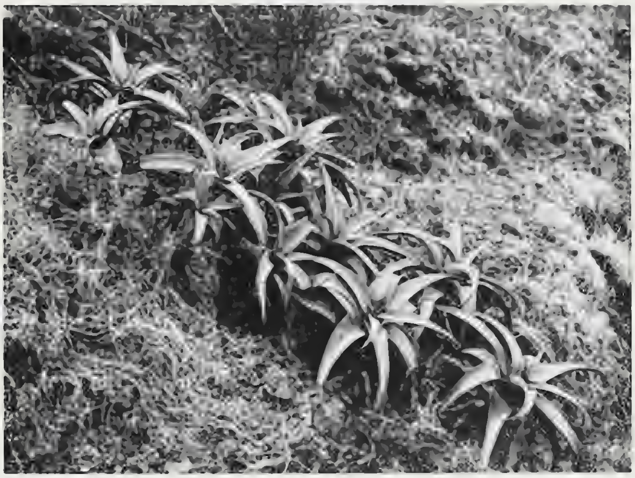

Fig. 2.

Plate I. *Aloe schelpei* Reynolds

Fig. 1.—Flowering plants photographed by Dr. E. A. Schelpe in September 1952, at Mulu Sayu, Boli Gorge, 54 km. north of Addis Ababa, Shoa Prov., Ethiopia. Height 60 cm.

Fig. 2.—Plants at the same locality, not flowering in May 1956, photographed by the author.

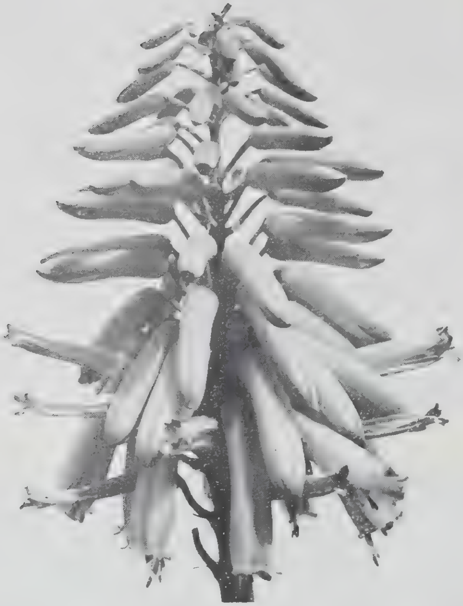

FIG. 1.

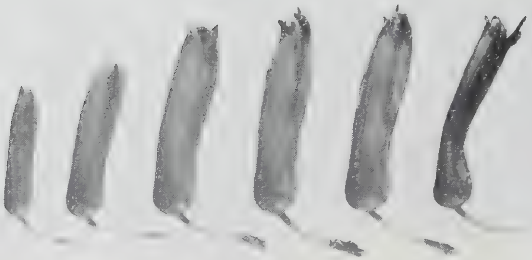

FIG. 2.

PLATE II. *Aloe schelpei* Reynolds.

FIG. 1.—Raceme × $\frac{9}{10}$. (*Photo:* Mr. L. C. Leach.)

FIG. 2.—Flowers 1/1 from bud to post-pollination stage. (From spirit material prepared by Mr. L. C. Leach, Greendale, Salisbury, S. Rhodesia.)

A NEW ALOE FROM MADAGASCAR

By G. W. Reynolds.

(With Plates III and IV.)

Aloe calcairophila Reynolds. Species nova, affinis *A. descoingsii* Reynolds, foliis distichis, floribus albidis differt.

Planta succulenta, parva, acaulescens, sobolifera mox caespitosa.

Folio c. 10, disticha, c. 6 cm. longa, 14 mm. lata, sensim attenuata, patentia, interdum recurvula; *supra* glauco-viridia, canaliculata; *subtus* convexa; *marginibus* dentibus cartilagineis albidis 2—3 mm. longis, 2—3 mm. distantibus ciliata.

Inflorescentia simplex, 20—25 cm. alta. *Racemus* 3—4 cm. longus, laxe 8—12 floribus. *Bracteae* ovato-acutae, albidae, 3 mm. longae, 2 mm., latae, obscure 3-nervatae. *Pedicelli* 5—6 mm longi. *Perianthium* albidum 10 mm. longum, cylindrico-trigonum, leviter ventricosum; *segmenta exteriora* per 5 mm. libera. *Antherae* inclusae. *Stigma* non exserta. *Ovarium* viridulum, 1½ mm. longum, 1½ mm. diametro. (Plates III & IV)

Habitat: Madagascar, Fianarantsoa Province, on limestone hill 2 km. S. of Ambatofinandrahana, alt. c. 1,400 m., fl. 27 Jan. 1957, Descoings 2114, holotype (TAN), isotype (K); cult. Johannesburg, fl. 28 May 1960, Descoings et Reynolds 8305 (PRE).

This is the second new species of Aloe discovered by Monsieur B. Descoings, at that time botanist at the Institut de Recherche Scientifique de Madagascar, Tsimbazaza, Tananarive.

M. Descoings found the plants on a south slope of a small dusty white hill of limestone, about 2 km. south of Ambatofinandrahana (which is west of Ambositra) on the road to Fenoarivo, at an altitude of about 1,400 metres, in the Province of Fianarantsoa, at c. 20° 34′ S., 46° 48′ E.

A. calcairophila is a charming little species with white flowers that are only 10 mm. long. The roots are cylindric, not fusiform. Plants sucker from base, and also at the axils of the lowest leaves, forming small dense groups. Leaves are distichous, the margins being ciliate with somewhat soft cartilaginous narrow long-pointed white teeth. Plants flower in April—May in cultivation, and in January—February in the wild state.

A. calcairophila is nearest allied to *A. descoingsii* Reynolds (see this *Journal* 24: 103, pl. 1 (1958)) but the latter has shorter rosulate spotted leaves, and shorter red flowers that are broader at base and narrower at the mouth.

Description: *Plant* with cylindric roots, small, acaulescent, suckering and forming groups.

Leaves c. 10, distichous, spreading almost horizontally and slightly recurved, 5—6 cm. long, 14 mm. broad at base, narrowing to an acute point; *upper surface* dull grey-green, without spots or markings, canaliculate; *lower surface* grey-green, rounded; *margins* ciliate with slender pointed cartilaginous rather soft white teeth 2—3 mm. long, 2—3 mm. apart.

Inflorescence simple, 20—25 cm. long.

Peduncle very slender, clothed with several white sterile bracts that are narrowly ovate-acute, 6 mm. long, 3 mm. broad, obscurely 3-nerved, shorter upwards.

Raceme 3—4 cm. long, laxly 8—12-flowered.

Bracts ovate-acute, 3 mm. long, 2 mm. broad, white, thin, scarious, obscurely 3-nerved.

Pedicels 5—6 mm. long.

Perianth white, cylindric-trigonous, slightly ventricose, 10 mm. long, basally obtuse, 4 mm. diam. at the middle, slightly constricted at the throat, the mouth wide open; *outer segments* free for 5 mm., with 3 crowded greenish nerves at apex, the apices subacute, spreading to slightly revolute; *inner segments* broader than the outer, dorsally adnate to the outer to the middle, with a greenish keel in upper half, the apices more obtuse and more spreading than the outer.

Filaments white, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn not exserted.

Stigma not exserted.

Ovary green, about 1½ mm. long, 1½ mm. diam.

ACKNOWLEDGMENTS.

I am indebted to:

Monsieur B. Descoings for plants, much data, photographs, and for considerable assistance when we investigated the Aloes throughout Madagascar in 1955.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for photographs and the ever-available facilities of the National Herbarium, Pretoria.

The South African Council for Scientific and Industrial Research for travelling grants that have enabled me to investigate the Aloes in Madagascar and Africa.

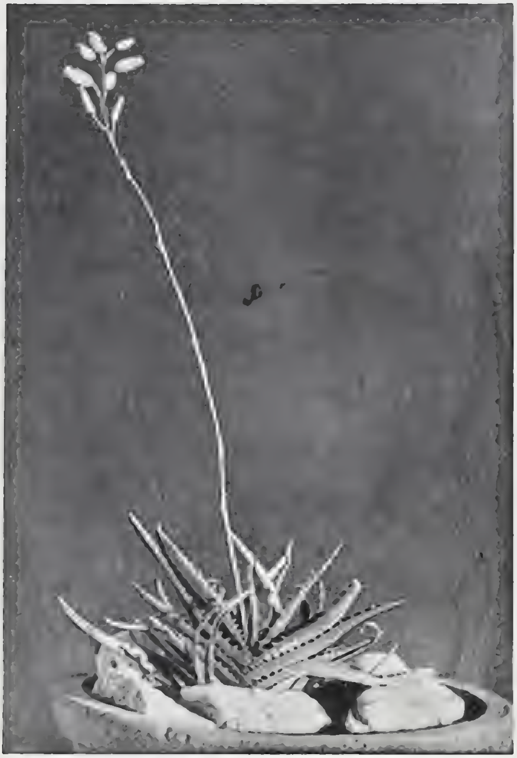

PLATE III. *Aloe calcairophila* Reynolds.

Plant × 2/5, from 2 km. S of Ambatofinandrahana, Fianarantsoa Prov., Madagascar, flowering in Johannesburg.

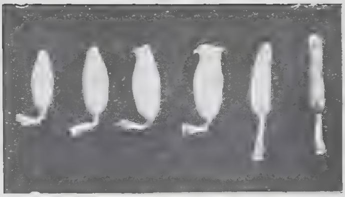

Fig. 1.

Fig. 1.—Flowers 1/1.

Fig. 2.—Raceme 1/1.

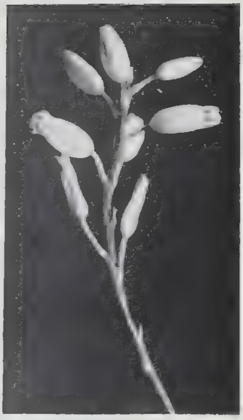

Fig. 2.

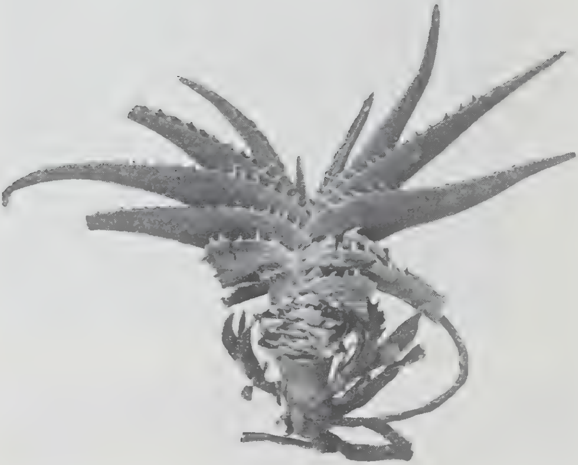

Fig. 3.

Plate IV. *Aloe calcairophila* Reynolds.

Fig. 3.—Leaf cluster 1/1.

THE IDENTITY OF *ALOE CRASSIPES* Bak.

By G. W. Reynolds.

(With Plates V and VI.)

Aloe crassipes was described by Baker in *Journ. Linn. Soc.* 18: 162 (1880) from "Tropical Central Africa, between Suakin and Berber, Schweinfurth 3765".

In his second publication (*Fl. Trop. Afr.* 7: 468 (1895)) Baker gives "Nubia, between Suakin and Berber, at Kishi". This same information is repeated in F. W. Andrews, *The Flowering Plants of the Sudan* 3: 261 (1956).

When I was in the north-eastern Sudan investigating the Aloes in 1956, I searched maps and made exhaustive enquiries for a place named Kishi, stated to be between Suakin (south of Port Sudan, on the Red Sea) and Berber which is north of Atbara on the Nile—but without success.

Subsequently, Mr. E. Milne-Redhead informed me that someone at Berlin had written the locality Kishi on the wrong printed label, but luckily there was a date—22nd May, 1870—on the label.

Milne-Redhead checked this date in Schweinfurth's book *The Heart of Africa* (London, 1873), a task simplified by N. E. Brown having made an index by dates.

In vol. 2, p. 203, Schweinfurth refers to "a brook fifteen feet in width called the Kishy," which "speeds swiftly along over the level steppe in the Babuckur country, and after receiving the Bodumoh, contributes materially to the volume of the Sway, which in that region has already assumed the dimensions of a considerable river".

Schweinfurth refers to a little spring beyond the "Kishy" called "Nambia, that went rippling between the bare gneiss flats". He continues, "Hidden deep amongst the long thick grass I here found an aloe, of which the blossoms were of a greenish cast; it was a plant that except to an eye keenly looking for botanical rarities would have been overlooked entirely".

Milne-Redhead has investigated Schweinfurth's localities and states, "The Kisi is a tributary of the Hu, itself a tributary of the Sue and runs from 4° 28′ N., 28° 49′ E. (about 11 miles due west of Mt. Bangenze) to a point 4° 50′ N., 28° 32′ E. Schweinfurth evidently did not realise that the Kisi joined the Hu before running into the Sue. It seems he may have crossed the Kisi going eastwards somewhere near where the Yambio-Juba road now appears to cross it, at 4° 43′ N., 28° 37′ E."

In 1954 I had travelled along the Yambio-Juba road en route to Mt. Bangenze (where I found *A. schweinfurthii* Bak.), and it is maddening to realise that, because of a wrong label having been used, I never knew I was in the very area where Schweinfurth had found *A. crassipes.*

The type locality of *A. crassipes*, therefore, appears to be about 30 miles W.N.W. of Mt. Bangenze, Equatoria Province, in the south-western corner of the Sudan Republic.

On 17th May 1937, J. G. Myers collected *A. crassipes* "between Mts. Bangenze and Duanvuru, on rock outcrops in grass-woodland, flowers stone coloured". Mt. Duanvuru is about 3 miles N. of Mt. Bangenze. Myers 6657 is an excellent specimen at Kew.

Plants of *A. crassipes* were found by Mr. Milne-Redhead in October 1937 (not flowering then) on a grassy slope above Kalenda Dambo, just west of Matonchi Farm, which is about 8 miles east of the Angola border, 30 miles west of Mwinilunga (over 300 miles west of Chingola in the Copper Belt) in the North-Western Province of Northern Rhodesia.

Three plants, in sterile condition, were sent by Milne-Redhead (under his No. 2644) to the late Mr. Basil Christian, and these subsequently flowered at Ewanrigg near Salisbury, Southern Rhodesia, but the inflorescences were damaged by pests.

On 23rd January 1938, Milne-Redhead collected plants from the same locality, in flower, and made specimens under his No. 2644A. "The flowers of my plant were a dull yellowish green with greenish nerves towards the base and dull purplish nerves towards the apex; the leaves were rather glaucous-green and unspotted. It was definitely an inconspicuous plant as Aloes go, when growing in grass".

In June 1959 I specially visited Kalenda Dambo just west of Matonchi, to investigate this species. I collected a plant (not flowering) which I then thought belonged to *A. christianii*, but when this plant flowered in Bryanston, Johannesburg, in January 1960, it proved to be *A. crassipes* —the same species that had previously been collected by Milne-Redhead in January 1938. This plant flowered again in March.

A. crassipes is an inconspicuous plant growing in grassland, and produces a 4—6-branched inflorescence that is only about 50—60 cm. in height. The flowers are dull yellowish-green, with the genitals not or very shortly exserted.

In general habit of growth, rosettes and leaves (and when not flowering), *A. crassipes* closely resembles *A. christianii* Reynolds (found in the Rhodesias, Nyasaland, Tanganyika Territory and the south-eastern parts of the Congo) and *A. guerrai* Reynolds (Angola).

A. christianii differs in having a more branched inflorescence 2 m. and more high, while *A. guerrai* has a divaricately branched inflorescence about 1 m. high, with oblique racemes and secund flowers. North of the Equator *A. crassipes* flowers in May, and south of it in January.

The leaf of the holotype of *A. crassipes* is probably a small immature inner one only 2 cm. broad, whereas in adult plants the outer leaves are 30—40 cm. long and 7 cm. broad.

The species can now be more fully described, and figured.

Aloe crassipes Bak. in *Journ. Linn. Soc.* 18: 162 (1880), in Th. Dyer *Fl. Trop. Afr.* 7: 468 (1895); Durand et Schinz *Consp. Fl. Afr.* 5: 305 (1893); Berger in Engler *Pflanzenr* Liliac.-Aloin. 240 (1908).

Description: *Plant* succulent, acaulous or very shortly caulescent.

Leaves c. 20—24, densely rosulate, spreading, about 40 cm. long, 7 cm. broad at base, gradually narrowing to the apex; *upper surface* dull glaucous-green, unspotted, flat low down, very slightly canaliculate upwards; *lower surface* slightly convex, glaucous-green, unspotted; *margins* armed with firm brown-tipped deltoid teeth that are 5 mm. long, 15 mm. apart at middle of leaf.

Inflorescence branched, 50—60 cm. high.

Peduncle basally plano-convex and 12 mm. broad, green, about 5-branched from below the middle.

Racemes rather densely flowered, cylindric-conic, the terminal 17 cm. long (lengthening to 25 cm.), 8 cm. diam. the lateral a little shorter.

Bracts narrowly deltoid-acute, 10 mm. long, 4 mm. broad, thin scarious, 5-nerved.

Pedicels the lowest 14 mm. long.

Perianth dull yellowish green, cylindric-trigonous, 38 mm. long, flat at base, cylindric and 10 mm. diam. across the ovary, very slightly narrowed above the ovary, thence trigonously very slightly enlarging upwards, and slightly compressed laterally in upper half; *outer segments* free for 13 mm., 5-nerved, the nerves dull green from base turning brownish to purplish brown in apical 10 mm., the apices subacute, slightly spreading; *inner segments* themselves free but dorsally adnate to the outer for 20 mm., with broad marginal border and a brownish keel, the apices more obtuse and more spreading than the outer.

Filaments the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 0—1 mm.

Stigma at length exserted 1—2 mm.

Ovary green, 7 mm. long, 4 mm. diam.

Sudan Republic: Equatorial Prov., near the Kisi River about 10 miles west of Mt. Bangenze, fl. 22 May 1870, Schweinfurth 3765, holotype

(K); between Mts. Bangenze and Duanvuru, on rock outcrops in grass-woodland, flowers stone coloured, 17 May 1937, Myers 6657 (K).

Northern Rhodesia: North-Western Prov., on slopes of Kalenda Dambo, ½ mile west of Matonchi Farm, fl. 23 Jan. 1938, Milne-Redhead 2644A (K); ½ mile west of Matonchi (30 miles west of Mwinilunga), c. 11° 40′ S., 23° 58′ E., c. 4,200 ft., cult. Bryanston, Johannesburg, fl. 30 Jan. 1960, Reynolds 9174 (PRE), same plant fl. again 30 March 1960, Reynolds 9174A (K).

ACKNOWLEDGMENTS.

I am greatly indebted to:

Mr. E. Milne-Redhead, Deputy Keeper of the Herbarium and Library, Kew, for photographs, for much data concerning Schweinfurth's localities and dates, for data concerning his own Aloe collections in the Mwinilunga and Matonchi areas in 1937–38, and for his ever available assistance over many years.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for many photographs, and for the facilities of the National Herbarium, Pretoria.

The South African Council for Scientific and Industrial Research, for travelling grants that have enabled me to investigate the Aloes in many parts of Africa.

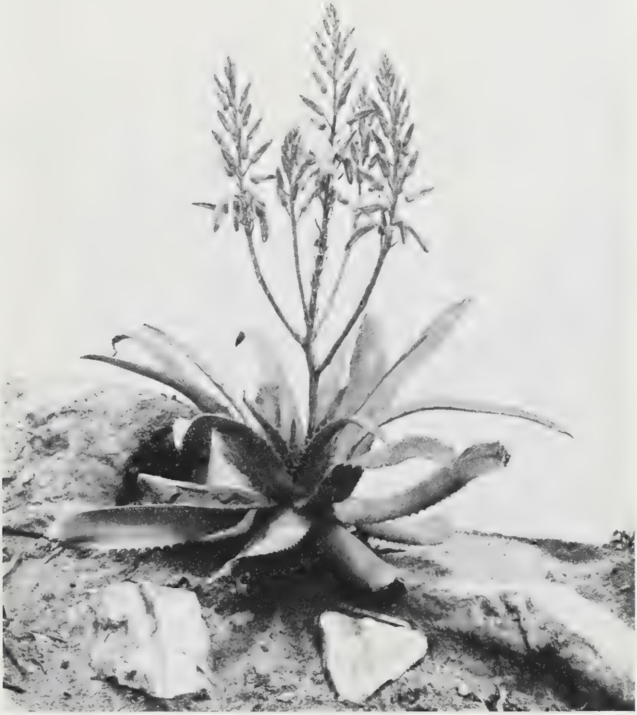

PLATE V. *Aloe crassipes* Bak.

Plant ex Matonchi, 30 miles west of Mwinilunga, Northern Rhodesia, flowering in Bryanston, Johannesburg, 30 January 1960. Height 65 cm.

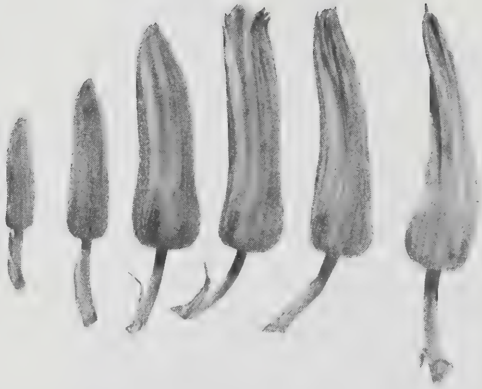

Plate VI. *Aloe crassipes* Bak.

Flowers 1/1, from bud to post-pollination stage.

A NEW SPECIES OF HUERNIA FROM PORTUGUESE EAST AFRICA

By J. J. Lavranos.

(With Plate VII.)

Huernia repens Lavranos, sp. nov.

Affinis *H. Volkartii* Gossweiler sed lobis coronae interioris valide deflexis, floribus majoribus, caulibus longioribus, semper repentibus differt.

Caules repentes tenus 30 cm. (50 cm.) longi, 7—9 mm. crassi, 5-angulati, virides vel viridipurpurei; folia minusquam 1 mm. longa, decidua; flores 2—3 aggregati; bracteae valde breves, lineares, aliquando absentes; pedicelli circa 10 mm. longi, teretes, penae glabri; sepala acuminata, 5 mm. longa; corolla 7—8 mm. longa, inter apices loborum 27 mm. lata, extus leviter scabra-tuberculata, puniceo-lutea, leviter maculis purpureis punctata, intus pallide lutea, fusco-purpurea marginata transversa fusco-purpurea striata, pars superior tubi et lobi papillis albescentibus vel purpureis tenus 2 mm. longis induti; lobi deltoidei acuti, patuli, basi 7—8 mm. lati, apicem penae deflexi; lobi intermedii 4 mm. longi, basi 1½ mm. lati, canaliculati, paulo deflexi; tubus suburceolatus, 6 mm. longus, orem penae constrictus, basi glabrus transversus fusco-purpureus striatus; corona exterior fusco-purpurea, 5 mm. diametro, basi tubi adpressa, lobis 1½ mm. latis longisque ad apices indentatis; coronae interioris lobi erecti, basi fusco-purpurei, supra lutei purpurei maculati, parte media conniventes, incumbentes et exhibiti supra antheras, parte apicale valide deflexi, crassiores et minute papillati.

Type Locality, Farm "Jaegerslust", Garuso, Portuguese East Africa, Schweickerdt col. 1958 (PRE, Holotype).

Stems always prostrate with a trailing habit, up to 30 cm. (50 cm.) long, 7—9 mm. thick, glabrous, green to purplish brown, 5-angled, with a transverse groove above each leaf.

Leaves less than 1 mm. long, persisting only for a few months.

Flowers two or three from base of young stems, developed successively.

Bracts very short, linear, sometimes absent.

Pedicel terete, appr. 10 mm. long, 1½ mm. thick, reddish purple, almost glabrous.

Sepals linear-acuminate, 5 mm. long, 3—5 nerved, the median nerve rather prominent.

Corolla spreading appr. 27 mm. between apices of lobes; *lobes* deltoid-acuminate, spreading, 7—8 mm. broad at base, about 8 mm. long, tapering to a very acute and slightly deflexed point, the outer surface 5-nerved, the 3 inner nerves ridge-like, purplish; *intermediate lobes* very prominent, 4 mm. long, $1\frac{1}{2}$ mm. broad at base, deeply canaliculate, somewhat deflexed; *outer surface* slightly scabrid-tuberculate on tube becoming more so on the lobes, pinkish-cream with faint purplish markings; *inner surface* narrowly margined with dark purple, cream with dark purple dots on the lobes and mouth of tube which are densely covered with dark purple and cream bristle-like papillae, up to 2 mm. long at mouth of tube but shorter on the lobes; *tube* sub-urceolate, 6—7 mm. long, slightly constricted at mouth, glabrous at base and lower portion with alternating continuous cream and dark purple bands.

Outer corona very dark purple, adpressed against the corolla-tube, appr. 5 mm. in diameter, the lobes $1\frac{1}{2}$ mm. broad and long with entire margins and one shallow indentation at their apices.

Inner corona lobes erect, 5 mm. long, dark purple at base, thereafter cream dotted with purple, connivent in the middle portion, incumbent upon and produced above the anthers, the apical part rather strongly deflexed, enlarged and minutely papillate.

In floral characters *H. repens* is very closely allied to *H. Volkartii* Gossweiler from Angola and Northern S.W. Africa. Both these species have a suburceolate corolla-tube, slightly constricted at the mouth, the inner corolla-surface densely covered with long, bristle-like papillae, while the inner portion of the tube is quite glabrous. Both have very long and narrow intermediate corolla-lobes. The colour pattern of the flowers is very similar, in *H. Volkartii,* however, the purple dots on the corolla-lobes are disposed in almost continuous bands. The corolla-lobes of *H. Volkartii* become so strongly revolute that they are folded back against the tube, a character not noticed in the new species. The outer corona lobes of *H. repens* are as long as they are broad with only one shallow indentation at the apex of each lobe while in all the specimens of *H. Volkartii* which the author has had the opportunity to examine, the outer corona lobes are slightly longer than broad with two indentations and a rather pronounced median projection. The inner corona lobes of *H. Volkartii* are more erect and much less deflexed and enlarged at their apices. Finally, the flowers of this species are much smaller than those of *H. repens.*

It is, however, in their respective habits of growth that these two species are widely different. The stems of *H. repens* are always decumbent and up to 50 cm. long while those of *H. Volkartii* are only 7—10 cm. long, ascending erect, thinner, the leaves more persistent.

Apart from this, its apparent closest ally, *H. repens*, appears to bear a rather marked affinity to *H. erinacea* Bally from Kenya but, apart from more marked floral differences, its habit is totally different.

It may be noted that, in its trailing habit, the new species resembles certain forms of *H. aspera* N. E. Brown, from Kenya, *H. pendula* Bruce from the Eastern Cape Province and *H. Leachii* Lavranos which occurs only about 50 miles from the type locality of the new species but belongs to a different section of the genus.

H. repens clearly belongs to the *Hystrix* section of White and Sloane's *macrocarpa-brevirostris* group.

This interesting new species was first collected by Professor Schweickerdt of the University of Pretoria on the farm "Jaegerslust" in the Garuso area of Portuguese East Africa, growing in *Brachystegia* bushland.

Plants collected by Prof. Schweickerdt flowered in the author's collection at Bryanston, Johannesburg, on the 29th December 1959, when the present description was drawn up. The name was suggested by the characteristic trailing habit of this species, the stems of which are never erect or even ascending.

I wish to thank Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, and his staff for the facilities of the National Herbarium, for the photographs accompanying this text and for much valuable help and advice.

My thanks also go to Prof. Schweickerdt for the living material and much interesting information regarding the new species and the area wherein it occurs.

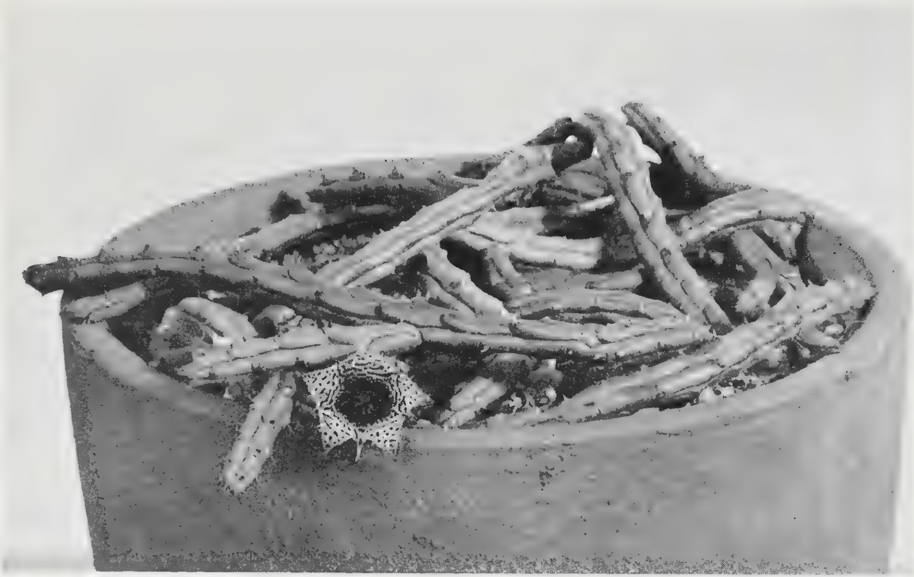

FIG. 2.

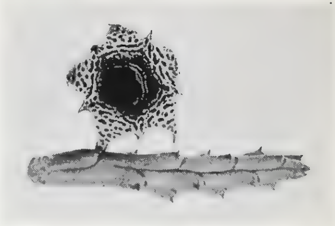

FIG. 1.

PLATE VII.

FIG. 1.—*Flowering stem, actual size.*

FIG. 2.—*The type plant, actual size.*

Photographs: Division of Botany, Pretoria.

FRANCIS MASSON, A GARDENER-BOTANIST WHO COLLECTED AT THE CAPE

By Mia C. Karsten.

(With Plates VIII—X.)

V. MASSON AS A DRAUGHTSMAN.

STAPELIAE NOVAE.

As already mentioned, Masson had the gift of drawing, which enabled him to paint the plants he found on his peregrinations. The history of Masson's drawings, water-colours, of South African plants, which are now in the British Museum, is given by Britten[133] and runs as follows:—"It was owing to inquiries instituted with regard to Masson's herbarium that the Department of Natural History of the British Museum came into possession of a large number of these drawings which, as far as they go are of almost equal importance with his specimens. A certain number of these drawings were known to have belonged to Banks, and a question as to the whereabouts of these led to the publication of an account of them in Journ. Bot. 1884, pp. 144–8[134]. This led in turn to the presentation to the Department by Mr. Charles Lee, great-grandson of the original James Lee in whose possession they had been[135], of nearly a hundred drawings, the value of which may be gauged by the fact that Mr. J. G. Baker based upon them descriptions of new species of *Gethyllis* and other monocotyledonous genera described in the Journal of Botany in 1885–6. All the drawings are now arranged in one series and form a large folio volume."

To Dr. Forbes, who saw the collection of drawings in the British, Museum, we are indebted for the following details. The size of the volume is 17 x 23 in., and it is about 3 in. thick. On the title-page is inscribed in handwriting: "Collection of Drawings by Francis Masson, Incorporating the series belonging to Sir Joseph Banks (See Jour. Bot. 1884, p. 144) and those presented by Mr. Charles Lee in 1885 (see Jour. Bot. 1885,

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[133] J. Britten, *Some Early Cape Botan. and Coll.*, in Journ. Linn. Soc.—Botany, Vol. xlv (1920–22), pp. 42–43.

[134] This account was written by Britten, under the title *Masson's Drawings of South African Plants*, Journ. of Botany, Vol. XXII, 1884.

[135] Cf. this Journal, Vol. XXV, Oct., 1958, p. 209.

p. 227[136].) Nos. 26 & 40 are by Webber[137], & No. 35 by J. Cleveley jnr."[138]

Apart from these three drawings referred to, not made by MASSON himself, the collection includes another one, which is really No. *40*, and which was later identified as a copy of one of GORDON's drawings.

A loose foolscap index to the drawings is in the volume, the index having a number of notes written in a hand different from that which wrote the index.

Miss EDWARDS of the Botany Department of the British Museum (Nat. Hist.) has kindly provided us with the following information *re* the four drawings for which MASSON is not responsible.

The drawing referred to as "No. 26" (= folio 26!), made by WEBBER, shows a different number on its face, viz. *16*. The pictured plant is identified (on drawing) as "Staphelia goodoni Mass.", also stated to be "Masson—Staphelia t. 40." There are not any notes by MASSON on the drawing. We may add to this that "Staphelia t. 40" is a reference to Stapelia Gordoni, Mass. (later renamed *Hoodia gordoni*, Sweet), tab. 40 of *Stapeliae Novae*, to which we will return later. Miss EDWARDS writes that there is another drawing under number 26 (folio 71), picturing an orchid, viz. *Satyrium striatum*[139]. A note on the front of this drawing has been rubbed off. But there is no indication that WEBBER was the artist of it. This drawing No. 26 is a puzzle!

No. 40 (*26*!). This actually is drawing No. *26*, which bears on its front the name "Webber" in DRYANDER's hand. There are no notes on the drawing which represents MASSON's "Stapelia Gordoni", and which WEBBER has copied from GORDON's original painting (see below).

No. *35*. The drawing bears no name, nor notes. There are separate drawings labelled Fig. 1–6. There is a reference to this drawing in another hand which reads:—"Apparently a copy of tab. 2, Kongl. Vet. Akad. Handl. XXXVI, 1775 (date most imp. as more than one series) pp. 69–75. Beskrifning pa en ganska och obekant Svamp, *Hydnora* africana, infran Goda Hoppets Udde i Africa inland af Carl Peter Thunberg."[140] This is a reference to a description and illustration of *Hydnora africana*, Thunb. (Hydnoraceae) by THUNBERG.

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[136] BRITTEN's paper on *Gethyllis*.

[137] JOHN WEBBER (1750?–1793), a landscape painter, was born in London as son of a Swiss sculptor. At an early age he was sent to Berne, where he was instructed by an artist of repute in both portraiture and landscape. He completed his training in Paris. Back in England he became a regular exhibitor at the Royal Academy, of which he became a full member in 1791. In 1776 he exhibited at the Academy a portrait of his brother, which attracted the attention of Dr. SOLANDER, and this led to his appointment as draughtsman to the third and last expedition of Capt. COOK to the South Seas. He returned in 1780, having witnessed the death of COOK, and was then employed for some time by the Admiralty in making finished drawings from his sketches for the illustrations to the account of the expedition, which was published in 1784.

The above biographical records have been taken from *Dictionary of National Biography* (1899).

[138] JOHN CLEVELEY Jnr. (1747–1786) was a marine painter. He learnt the art of water-colour painting and tinted drawings. He first exhibited at the Royal Academy in 1770, and up to 1782 his works are always signed "John Cleveley, junior". In 1772 he was chosen to accompany Sir JOSEPH BANKS as draughtsman, on his voyage to the Hebrides, Orkneys, and Iceland. The numerous sketches which he made on his voyage he afterwards worked up into water-colour drawings. Several of them are preserved in the British Museum.

We found the above records in *Dict. Nat. Biogr.* (1887).

[139] *Satyrium striatum*, Thunb.!

No. *40*. Miss EDWARDS writes that this drawing shows another number, 21, pencilled by the side of 40. The only note written on its face is "leaves deep green" (by MASSON? M.K.). MASSON gives no name nor locality. FORBES who saw this drawing, writes that in the index opposite the entry for No. *40* (21), *Pachypodium namaquanum*, is written "Webber, copied from a drawing of Captain Gordon's at the Cape of Good Hope." This is referred to in BRITTEN's article on MASSON's drawings of S.A. plants in Journ. of Bot., 1884, p. 145, in text and in footnote, where it is stated that "This copy is identical with a plate (lettered 'Pentandria Monogynia') facing p. 124 of Paterson's *Narrative*, etc. (1789), and the latter was no doubt prepared from Gordon's original drawing." The plant pictured in these two works is *Pachypodium namaquanum*, Welw. (Apocynaceae).

So much for the four drawings made by other artists.

BRITTEN in his paper on MASSON's drawings, quotes the historical account of these pictures from an article in the Journal of Science and Arts, Vol. iv (1818), p. 199, which is well worth reproducing here in full. It reads:—"Mr. Francis Masson, the late intelligent and industrious collector of plants, while employed in 1775, at the Cape of Good Hope, is procuring supplies for the Kew Gardens, unexpectedly met with, among the Dutch soldiers who then guarded that colony, an artist of great skill as a designer of the objects of natural history. Availing himself of the circumstances, he formed a considerable portfolio of coloured drawings of the samples of the more curious objects of his pursuit, and especially of such as he deemed most refractory to exotic transplantation. They have been since added, by Sir Joseph Banks, to those treasures so long regarded throughout the world, to their possessor's and our country's honour, as the best funds of Science."

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[140] The title of this publication as given by THUNBERG is slightly different from the one quoted here which shows some minor mistakes in the Swedish. The proper title of this paper is: Beskrifning på en ganska besynnerlig och obekant svamp, *Hydnora africana*, ifrån Goda hupps udden. Kongl. Vetenskaps Academiens Handlingar, Stockholm, Vol. 36, tab. II (1775). Transl.: Description of a most peculiar and unknown fungus, *H. afr.*, from the Cape of Good Hope.—See also this Journal, Vol. V, Oct., 1939, pp. 150–1; Vol. XII, Oct., 1946, pp. 170–1.

Hydnora africana is a parasitic fungus-like plant with a fleshy warted subterranean rhizome. The flowers are large, with an unpleasant smell, arising singly from the rhizome. A most remarkable form of plant life!

MacOwan[141], referring to the above notice in the Journal of Science and Arts, suggests that the artist referred to was the Swedish soldier Oldenburg, who was, as may be recalled, Masson's fellow-traveller on his first journey into the interior (1772–3). There are no records of Masson having commissioned Oldenburg to make sketches of the plants collected. Moreover, we have the statement on the title-page of the volume of drawings, that they are, with a few exceptions, Masson's work. We have seen that one drawing, No. 115 (*Massonia latebrosa*, Mass.) is inscribed in his own hand "Masson pinxt." Other ones (e.g. the picture of Lachenalia succulenta, Mass. (*L. patula*, Jacq.)] show the inscription "F. Masson", which may indicate that he himself is the artist. The transcripts of the notes on a number of his drawings, received from the British Museum, all show that the pictures were made of plants collected, and subsequently grown in his little garden at Cape Town, during the time of his second visit to the Cape, viz. long after Oldenburg had left the Cape for Madagascar (1774). Altogether it appears to be most unlikely that the collection includes drawings made by Oldenburg.

There is one thing that may cause doubt as to the identity of the artist: the remarks on the colouring of the picture, found on some of the drawings[142], could have been written with somebody in mind who executed them. But who? Not Col. Gordon who had his drawings finished by somebody else, as we shall see later.

The suggestion that some of the drawings in the British Museum are the work of Johannes Schumacher (or Johan Schoenmaker, the Dutch version[143]), a draughtsman ("tekenaar") employed by Hendrik Swellengrebel, son of the governor, who travelled at the Cape in 1776–7, can, in our opinion, be safely ruled out, the time of his stay being after Masson's first sojourn at the Cape. However, it is thought possible that Schumacher has done some drawing for Col. Gordon, who returned to the Cape in 1777. The drawings Schumacher made on his journey and elsewhere at the Cape, were published in collected form in 1951. Hallema, the editor of this album of reproductions of the Schumacher aquarelles, compares these pictures with those in the

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[141] MacOwan, *Personalia of Botan. Collectors at the Cape*, republ. by Verduyn den Boer in Botanists at the Cape I, p. 42 (1929).

[142] See this Journal, Vol. XXV, Oct., 1959, p. 305.

[143] The information regarding the draughtsman Schumacher has been taken from Forbes' thesis *The Expanding Horizon* (1957). Writing about the authorship of Gordon's drawings, Forbes quotes from A. Hallema, editor, *The Cape in 1776–77. Aquarelles by Johannes Schumacher from the Swellengrebel Collection.* The Hague, 1951; and G. L. le C. Count de Buffon, Histoire Naturelle &c. Suppl., nouvelle édition, Vol. V, p. 58. Amsterdam, 1785.

GORDON collection in the Rijksmuseum at Amsterdam, and remarks that there is an undeniable affinity between the drawings in the two collections in spite of difference of subject. In his discussion of a giraffe shot by GORDON on the last of his journeys into the interior, Professor ALLAMAND (BUFFON, Vol. V, p. 58) mentions "a soldier who served him as a draughtsman". The artist referred to was not unlikely the beforementioned SCHUMACHER. We will return to GORDON's drawings when dealing with MASSON's *Stapeliae Novae.*

We may cite a small selection of MASSON's own drawings, apart from those already mentioned in the chapter on his journeys into the interior, bearing notes which give some indication as to the route followed. Notes which appear in MASSON's own hand are printed in italics. Moreover, these and other information found written down on the drawings have been put between quotation marks, in order to distinguish them from additional notes by Miss EDWARDS and the author of this paper.

ORCHIDACEAE.

No. 41. Bartholinia Burmanniana, Ker (= *B. pectinata*, R. Br.!). On front: "*Orchis* (?) barbata? Nov. 19th."

No. 42. *Corycium orobanchoides*, Sw. On front: note by R. BROWN, "returned April 11, 1820." This is followed by the names, in another hand, "Satyrium pyramidale Corycium obt. .tum" (cannot be properly deciphered!) and several other identifications.

No. 49. *Disa spathulata*, Swartz. On front: "*Roode Zant Octobri 1790. Brouzer* [?] *touched* [?] *round y edges.*" On reverse: "*Rode Zant 1790.*" There is a second drawing, No. 50, which shows a note in R. BROWN's handwriting, "returned April 11, 1820."

No. 51. Disa grandiflora, L. f. (= *D. uniflora*, Berg.!). On front: "*Disa uniflora*", followed by a note that has been erased. This is the beautiful red *Disa* of the Cape.

No. 69. *Pterygodium catholicum*, Swartz. On front: "This is very like the figure of [?] quoted for Ophrys catholica." This is followed by the note "returned April 11, 1820" in R. BROWN's hand, and an identification (by?), "Ophrys cucu . . ta" (cannot be deciphered, cucullata perhaps?).

IRIDACEAE.

No. 40(?). *Moraea tristis*, Ker. The folio bears No. 79, but is numbered 40 on the drawing, which does not show any notes.

No. 77. *Moraea edulis*, Ker. On front: "*Iris edulis*".

No. 83. *Moraea papilionacea,* Ker. On front of 3 drawings: "Moraea papilionacea MS. Iris papilionacea Linn. Suppl. 98."

No. 85. *Moraea pavonia,* Ker. On front: "Moraea pavonia MS. Iris pavonia Linn. Suppl. 98."

AIZOACEAE.

No. 10. Mesembryanthemum digitiforme, Thunb. (M. digitatum, Ait.; *Dactylopsis digitata* (Ait.), N. E. Br.)[144]. On front: "Mesembryanthemum digitiforme MS", according to BRITTEN in SOLANDER's handwriting.

A very peculiar succulent plant, dwarf and pulpy. Its very stout alternate leaves—2 or 3 to each growth—have large tubular sheaths clasping one another closely and concealing the short stem.

No. 11. Mesembryanthemum ciliatum, Ait. (= *Brownanthus ciliatus,* (Ait.) Schwantes). On front: "Mesembryanthemum ciliatum MS." (SOLANDER's handwriting?)

A dwarf, bushy succulent, remarkable for the long deflexed hairs which ciliate the bases of the leaf-sheaths.

GERANIACEAE.

No. 2. *Monsonia speciosa,* L. f. On front: "*Monsonia speciosa γ tripinnata.*"

While checking a specific name in SOLANDER's MSS, Miss EDWARDS found that he gives details of the location of the MASSON plant, viz. "Massonia sp. No. 2 in Swartland, groene kloof et alibi ad Promont. C [B?] Spei. Drakensteen: campis glareosis [barren lands] Floret Sep., Oct."

No. 4. *Monsonia lobata,* Willd. On front: "*Monsonia speciosa γ lobata.*"

ZYGOPHYLLACEAE.

No. 8. *Augea capensis,* Thunb. On front: "*Piotes teretifolia.*"

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[144] There are some notes about this species in BRITTEN's paper on MASSON's drawings (Journ. Bot., 1884, p. 147). BRITTEN points out that this species is said by HARVEY to be "now wanting in Herb. Thunb." From its absence from the Herbarium of the British Museum, and the fact that the description in SOLANDER's MS. was copied from THUNBERG, it is supposed by him that MASSON himself did not preserve dried specimens of it. In a footnote BRITTEN adds to this that it would appear, however, from the "Hortus Kewensis", ii, 181, that MASSON sent living plants to Kew, for its record runs "Cape of Good Hope. Mr. F. Masson. Introd. 1775." At the time this article was written, this species did not seem to have been since met with. As there was no published figure of it, MASSON's drawing, bearing the name "Mesembryanthemum digitiforme MS" in SOLANDER's hand, was considered by BRITTEN to represent the type of the species, which was not in the Kew Herbarium at the time.

This species was named and described by SOLANDER in his MSS as P. teretifolia. It is an annual, glabrous, fleshy herb, with the aspect of a Mesembryanthemum. THUNBERG found it in the Karroo, "between Oliphants River and Bocklandsberg."

RUTACEAE.

No. 6. *Calodendron capense,* Thunb. (= Calodendr*um*!). On front: "*Calodendron capense.*"

EUPHORBIACEAE.

No. 39. *Euphorbia meloformis,* Ait. On front: "*Euphorbia melo formis.*"

ASCLEPIADACEAE.

No. 22. Stapelia ciliata, Thunb. (= *Diplocyatha ciliata,* (Thunb.) N. E. Br.!). See further under *Stapeliae Novae.*

SCROPHULARIACEAE.

No. 31. *Hyobanche sanguinea,* L. On front: "*Hyobanche sanguinea.*"

An annual parasitic plant, short and erect, with scale-like leaves and a very bright purple flower spike. It grows on the roots of *Blaeria muscosa* and other Ericaceae.

* * * * *

We now come to another set of MASSON's drawings, viz. a number of pictures, water-colours, of various Stapelieae, published during the time he spent in England after his return from his second period of residence at the Cape, previous to his journey to America. This publication contains 41 reproductions made from a collection of paintings for the greater part made by himself at the Cape, and is greatly to MASSON's credit. Its complete title is *Stapeliae Novae: or, A Collection of several New Species of that Genus; discovered in the Interior parts of Africa.* The work was published in London, and printed by W. Bulmer & Co. For George Nicol, Bookseller to His Majesty, Pall-Mall. Although dated 1796, the greater part of the work appeared in the course of 1797. In the volume we find a statement that it was published, "as the Act directs", in four parts or numbers, viz. plates 1–10 on April 27, 1796; pl. 11–20 on March 1, 1797; pl. 21–30 on May 20, 1797; and pl. 31–41 on June 20, 1797. However, the last two numbers were actually published only in the second half of the year, as is learnt from a short note in MASSON's hand, concerning the distribution of apparently complimentary numbers of *Stapeliae Novae* (Plate VIII), in the Botany Department of the British Museum.

Good Sir

When the two last Number of the Stapeliae are published I have to request the favour of you to receive of Mr. Nicol the following Numbers viz. For His Majesty the two last
Numbers For Her Majesty – – – – – – – Do.
For Sir Josep Banks – – – – – – – – – Do.
For Mr. Forner – – – – – – – – – – – – Do.
For Professor Thunberg three last Do.
For yourself a full Sett.

I am Sir you much obliged
Humble Servant Franc Masson

Gravesend August
29 1797

No name of addressee is given, but the content of the note makes it clear that it was not BANKS, who is meant by "For yourself a full Sett". It might well have been DRYANDER, BANKS' librarian.

Mr. NICOL is His Majesty's bookseller mentioned above.

When MASSON wrote this little letter from Gravesend, he was about to sail for North America, his last mission[145].

Returning to *Stapeliae Novae*, it is a folio volume of excellent get-up. The coloured plates show craftsmanship, the text is well printed. The volume opens with the following Dedication to the King (GEORGE III), which elucidates MASSON's achievements as a plant collector, and bears testimony to his profound interest in the work he had undertaken and his keenness to go on with it.

"Sire,

Compelled to leave the Cape of Good Hope, lest I should lose, in an expected invasion, the Collection of living Plants that I had made, during ten years residence there, I returned to England; and was indulged, on my return, with your Majesty's gracious permission to remain a year at home. Unwilling to waste so much time in idleness, I resolved to render this vacation somewhat profitable to the science of Botany, by publishing observations made on that subject, in the interior deserts of Africa.

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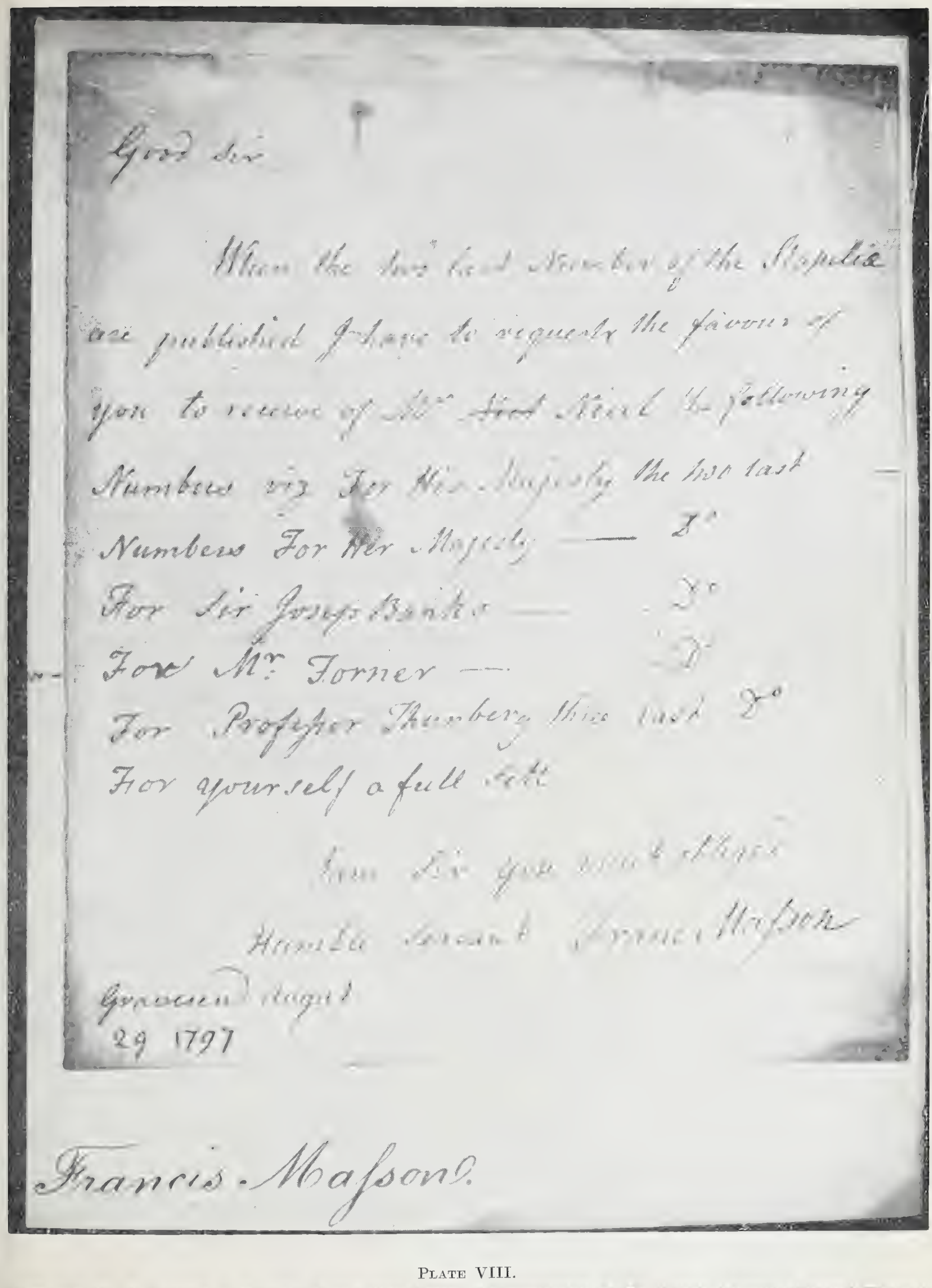
[145] See this Journal, Vol. XXV, Oct., 1959, p. 309.



Good Sir

When the two last Number of the Stapelia are published I have to request the favour of you to receive of Mr ~~Nicl~~ Nicol the following Numbers viz For His Majesty the two last Numbers For Her Majesty — D°
For Sir Joseph Banks — D°
For Mr Forner — D°
For Professor Thunberg three last D°
For yourself a full sett

I am Sir your most Obed
Humble Servant Franc Masson

Greenwich August
29 1797

Francis Masson.

PLATE VIII.

Short note by F. Masson re the sets of Stapeliae Novae. By permission of the British Museum (Natural History).

"Twenty-four years[146] I have enjoyed the honour of being, by your Majesty's command, attached to the Royal Gardens at Kew, as a collector of exotic plants. I have had the satisfaction of seeing several hundreds of those, collected by me in various climates, flourishing there, more beautifully, in some instances, than in their native soils. And I have observed, with the exultation I hope of honest pride, my name frequently repeated in the *Hortus Kewensis*, published by my deceased patron and friend William Aiton.

"Let these circumstances, Gracious Sire, plead some excuse for the ambition that induced me to solicit the honour of laying my little work at your Majesty's feet.

"Penetrated with gratitude for the uniform protection I have unceasingly received from Your Majesty's bounty—anxious to recommence my employment as a collector, and still enjoying, though in the afternoon of life, a reasonable share of health and vigour, I am now ready to proceed to any part of the globe, to which your Majesty's commands shall direct me. Many are the portions of it that have not yet been fully explored by Botanists—all of them are equal to my choice.—To extend the science of Botany, to enrich the Royal Gardens at Kew, and to obey your Majesty's gracious commands, are the only objects of ambition that actuate the breast of your Majesty's most humble, most dutiful and most grateful Servant, Francis Masson."

With reference to the above, Masson was to stay another year at home.

The Dedication is followed by a lengthy Preface, of which the following may be quoted here:—

"The tract of land, which forms the Cape of Good Hope, widens gradually as it recedes from the sea; the western coast consists of extensive sandy deserts, incapable of cultivation, and the interior part exhibits ridges of high mountains; between them are other deserts, the soil of which is a reddish earth, intermixed with rotten schistus, impregnated with salt.

"The deserts, called Karro, are furnished with great variety of succulent plants, endowed by nature, as the camel is, with the power of retaining within them water, sufficient to enable them to survive the long periods of drought which prevail in those regions. The climate differs very much from that near the Cape, where the vegetable productions approach more to the nature of Alpine plants.

"This tract of country has afforded more riches for the naturalist than perhaps any other part of the globe. When the Europeans first settled

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[46] Since 1772, when he arrived at the Cape on his first mission as a plant collector.

there, the whole might have been compared to a great park, furnished with a wonderful variety of animals, such as the elephant, the rhinoceros, the hippopotamus, the camelopardalis[147], numerous species of the genus antelope, the lion, the panther[148], hyaena, and many other ferocious animals; but since the country has been inhabited by Europeans, most of these have been destroyed or driven away.

"The ornithology of the Cape is very interesting; incredible numbers of strange sorts of birds, quite unknown to the inhabitants, often migrate from the interior country, and visit the European settlements.

"The vegetable kingdom seems almost inexhaustible, and most of the genera at the Cape are peculiar to the southern parts of Africa; the variety of climates and local situations afforded by the nature of the country, produce such a diversity of species, that the age of man would scarce be sufficient to complete a Flora of it, accompanied with exact figures and scientific descriptions.

"The Dutch, although celebrated as lovers of Natural History and Botany, had possessed the Cape near 130 years before any considerable number of plants from thence were introduced into their European gardens, a few geraniums and succulent plants excepted. Even the zoology of this interesting spot seems to have been very little studied by them.

"The curious productions of the Cape had been too much neglected until the year 1771, when Captain Cook returned from his first voyage round the globe, and landed the Naturalists who accompanied him [BANKS and SOLANDER!] at the Cape Town; they were much gratified by the treasures they met with . . . "

This made BANKS, on his return to England, suggest to the King that a professional gardener should be sent out to the Cape to collect seeds and plants for the Royal Gardens at Kew, and, to use MASSON's own words, " . . . his Majesty was graciously pleased to adopt the plan, though at that time so little approved by the public, that no one but myself chose to undertake the execution of it . . . ." So MASSON left for the Cape and remained there for nearly two years and a half, "during which time I succeeded so well, that my mission has been the cause of several other botanical expeditions of the same kind being undertaken, by order of the Emperor, of the late King of France, and of the King of Spain."[149]

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[147] *Giraffa camelopardalis capensis*, Giraffe, Kameelperd.

[148] Not the Panther, but the Leopard or Luiperd, *Panthera panthera*.

[149] Emperor JOSEPH II of Austria, who sent BOOS and SCHOLL; LOUIS XVI, the ill-fated King of France, and CHARLES IV of Spain. We do not know about collectors ordered to the Cape by the kings of France and Spain.

After this Masson proceeds to his second visit to the Cape, and a full quotation may be given of the remaining part of the Preface. During those ten years at the Cape "I had", quoting Masson, "opportunities more minutely to search that great tract of country; the various collections I have sent from thence to Kew Gardens have been cultivated with so much success, that all praise of the cultivators is useless, for the garden itself sufficiently demonstrates the care and skill with which Cape plants have been treated in that excellent school of horticulture.

"Some Cape genera consist of numerous species, viz. Geranium Erica and Mesembryanthemum: very elegant works have been published giving account of the Gerania[150]; but the history of the Mesembryanthema is very deficient, and the deserts contain still many species unknown to Botanists.

"Two species only of Stapelia were heretofore described by Botanists[151]; the genus now promises a numerous harvest of species. In my various journeys through the deserts I have collected about forty, and these I humbly present to the lovers of Botany. The figures were drawn in their native climate, and though they have little boast in point of art, they possibly exhibit the natural appearance of the plants they represent, better than figures made from subjects growing in exotic houses can do.

"The genus of Stapelia seems peculiar to deserts. All the new species I have seen inhabit the desert parts of the Cape countries. The particular places where they are found are annexed to the specific descriptions of each.

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[150] Masson could be referring here to N. L. Burman's work *Specimen botanicum de geraniis*. Lugd.-Bat., 1759, 4, 52 pp., 2 plates (12 figs.). There is also L'Héritier's folio, *Geraniologia, seu Erodii, Pelargonii, Geranii, Monsoniae et Grieli historia iconibus illustrata*. Paris, 1787–8, with 44 plates. The text was never published. A. J. Cavanilles in his *Dissertatio Botanica*, Paris, 1787, part 4, published 128 species with plates—"de Geranio"—; many of these species are from the Cape and were collected by Thunberg and others. The latter two works in particular, containing so many illustrations, could have been styled as "elegant".

[151] Masson probably refers here to *Stapelia variegata* and *S. hirsuta*, both named and described by Linnaeus in his *Species Plantarum*, first edition, p. 217 (1753), after they had been described and figured in earlier works, by Hermann, Bradley, Jan Burman, before the introduction of the binominal system in Linnaeus' *Sp. Plant.*

Stapelia variegata was the first species of this genus of plants to be discovered. It was originally described and figured as "Fritillaria crassa promontorii bonae spei", by Johannes Bodaeus Stapelius (or van Stapel), a Dutch physician, in his edition of Theophrastus: *De Historia Plantarum, libri decem*. Amsterdam, 1644. Stapelius having died in 1636, the work was brought out by his father Egbert Bodaeus. The "Fritillaria" figure in Stapelius' work is reproduced on p. 74 of Vol. I of White & Sloane, *The Stapelieae*. James Britten says there is a superficial resemblance between the appearance of the flower of *S. variegata* and that of *Fritillaria meleagris*, hence the name given by the early author.

"Several authors have written on this genus. Among the first are Hermannus[152], Bradley[153], &c. who wrote early in this century.

"Forskâl[154], in his journey in Arabia Felix, discovered five new species, and has given good figures of two of them. Thunberg, in his Prodromus[155], mentions five species, three of them I cannot determine, viz. S. mammillaris, S. fasciculata, S. caudata, because his descriptions are so short; probably in his Flora Capensis[156] they will be more fully defined. I shall be glad to quote them as soon as it is in my power to ascertain them.

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[152] In HERMANN's *Horti Academici Lugduni-Batavi Catalogus*, etc., Leyden (1687), there is a description on p. 52 of *Stapelia variegata*, L., together with a plate (p. 53): "Apocynum humile aizoides siliquis erectis Africanum. Fritillaria crassa Prom. Bon. Spei. Stapel Theophr. 335." In his *Paradisus Batavus*, etc. (1698), the same description is given on p. 62, without the plate.

[153] This is RICHARD BRADLEY, professor of botany at the University of Cambridge, who wrote the first work devoted wholly to succulents: *The History of Succulent Plants* (Historia plantarum succulentarum), in 5 vols. London, 1716–27. He figures two Stapelias, viz. *S. variegata* and *S. hirsuta* (decade III, 1725, tab. 3 and 5).

[154] PETRUS FORSSKÅL (1732–1763), outstanding pupil of LINNAEUS, who died of the plague in Yemen (S. Arabia), while a member of an expedition sent out at the expense of King FREDERICK V of Denmark. The expedition, to Egypt, Arabia and India, was headed by KARSTEN NIEBUHR, a German traveller, who ultimately reached Bombay as the sole survivor, and eventually got back to Copenhagen in 1767. FORSSKÅL's works were published posthumously by NIEBUHR, in a series of books, including the *Flora Aegyptiaco-Arabica* (1775) and *Icones Rerum Naturalium* (1776). The descriptions he gives of the five Stapelieae he collected, were fragmentary, and only two, now known as *Caralluma quadrangula*, N. E. Br. (Stapelia quadrangula, Forssk., Flora Aeg.-Arab., p. 108, 1775) and *Caralluma subulata*, Decaisne (S. subulata, Forssk., Flora Aeg.-Arab., p. 108, 1775, figured in Icon. Rerum Nat., 1776), have been satisfactorily identified (see WHITE & SLOANE, *The Stapelieae*, Vol. I (1937), pp. 252 and 176 respectively.

The above notes on FORSSKÅL have been taken from A. HJ. UGGLA's paper *Daniel Solander och Linné*, in Svenska Linné—Sällskapets Årsskrift, Årgang XXXVII–XXXVIII, 1954–1955, p. 33, footnote 5 (reprint); and WHITE & SLOANE, *The Stap.*, Vol. I, pp. 78–79.

[155] *Prodromus Plantarum Capensium*, first part (1794), see also footnote 114.

Two of the three inadequately described species mentioned by MASSON were later on identified and classified with other genera, viz. Stapelia mammillaris (Linnaeus, Mantissa Plantarum, ii, p. 216, 1771), now known as *Caralluma mammillaris*, N. E. Br., and S. caudata, Thunb., which was later on classified as a species of *Brachystelma*, R. Br.—a genus belonging to another tribe of Asclepiadaceae—under the name *B. crispum*, Grah. The latter is a native of the western part of the Cape (neighbourhood of Cape Town; Malmesbury Div.). The gen. *Brachystelma* numbers about 60 species, viz. 40 in S. Africa, and the remaining 20 equally divided between trop. Africa and India.

The third, S. fasciculata, is an unidentified species discovered and named by THUNBERG.

[156] *Flora Capensis*, sistens Plantas Promontorii Bonae Spei Africes, etc., Vol. I, fascicula 1, 2 and 3, publ. in 1807, 1811 and 1813 respectively (Upsaliae); Vol. II, fasc. 1 and 2, publ. in 1818 and 1820 (Hafniae); and the only complete edition, edited by I. A. SCHULTES, publ. in 1823 (Stuttgardtiae).

The following eight "Stapeliae" are described by THUNBERG in his *Flora Cap.*: S. pilifera, L. f. (*Trichocaulon piliferum*, N. E. Br.); S. mammillaris, L. (*Caralluma mammillaris*, N. E. Br.); S. incarnata, L. f. (*Caralluma incarnata*, N. E. Br.); *S. hirsuta*, L.; S. ciliata, Thunb. (*Diplocyatha ciliata*, N. E. Br.); S. fasciculata, Thunb, (undetermined sp.); *S. variegata*, L.; and S. caudata, Thunb. (*Brachystelma crispum*. Grah.). Three of these are described and pictured in MASSON's *Stapeliae Novae*, viz. S. pilifera, incarnata and ciliata.

"Colonel Gordon and Captain Paterson discovered some very remarkable species; but these are very obscure, for want of complete figures and descriptions.[157]

"In the splendid work on East India plants[158], now publishing at the expence of the Honourable East India Company, one new species is given.

"As so many species of this genus have been found in the southern parts of Africa, in Arabia Felix, and in India, presumptive proof may be drawn that many remain yet undiscovered; I am certain that the Cape countries contain several that I have not had an opportunity of procuring.

"As no one but myself possesses the figures contained in this little work, I have thought it my duty to present them to the public, in hopes that they may prove acceptable, both to the Botanist and cultivator of plants. Generic and specific descriptions are given, and some useful hints annexed to the description of each species."

The descriptions of the plants, particulars about their habitat, and various other information are all in Latin. Many of the drawings were made of plants collected by him which he had planted in his little garden at the Cape, where they were flowering. "*Florebat* in hortulo meo in Cap. b. Spei", often followed by the year, occasionally also the month, when the plant was flowering, is a remark we find under nearly half of the descriptions. Nothing is known about the site of MASSON's garden at Cape Town.

Masson made no effort to subdivide the genus *Stapelia*, but, quoting WHITE & SLOANE[159], "he was a botanist of much acuteness and the sequence of his descriptions shows that he sensed many of the distinctions which later men [ROBERT BROWN, A. H. HAWORTH, N. E. BROWN !] were to put into words." For instance, he had 6 *Huernias*, as now understood, and grouped them together. Also his 3 *Duvalias* and 3 *Piaranthus* he grouped together, while of the 18 *Stapelias*, in the restricted modern sense, he placed 15 together. The remainder of the 41 species include

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[157] It is difficult to say to what species MASSON is referring here, but they most likely include the curious "Stapelia" sp., which PATERSON discovered in Little Bushmanland in 1778 or 1779, and of which he figured a fruiting stem in his *Narrative*, etc. (1789); there is a reproduction of this figure in WHITE & SLOANE, *The Stapelieae*, Vol. I (1937), p. 1. This plant was later on described by W. J. HOOKER as Stapelia cactiformis (1844), but is now known as *Trichocaulon cactiforme*, N. E. Br.

MASSON might also have had in mind the peculiar Stapelia Gordoni, Mass. (*Hoodia gordoni*, Sweet), discovered by Col. GORDON.

[158] W. ROXBURGH, *Plants of the Coast of Coromandel*, selected from drawings and descriptions presented to the Hon. Court of Directors of the East India Company. Published by their order, and printed by W. Bulmer for George Nicol, bookseller. London, 1795–1819; 3 vols. Vol. I (1795) contains 68 pp. and 100 coloured plates. Stapelia adscendens. Rox. t. 30, p. 28 of Vol. I = *Caralluma adscendens*, R. Br. is probably the "Stapelia" referred to by MASSON.

[159] WHITE & SLOANE, *The Stapelieae*, Vol. I (1937), p. 85.

1 *Diplocyatha* (the only known species), 1 *Trichocaulon,* 1 *Pectinaria,* 7 *Carallumas,* and 1 *Hoodia.*

Four of the species depicted were known to THUNBERG, three of them having been discovered by this botanist. The fourth one, known to both THUNBERG and MASSON, was discovered by a much earlier collector, and was figured in JAN BURMAN'S *Decades Africanarum Plantarum,* 1738 (see below). Among the remaining 37 species there is another one of that early period, also figured in BURMAN'S work. Finally there is a drawing of a species discovered by Col. GORDON. This leaves altogether 35 species, all "nondescripts", discovered and named by MASSON. Eight of these are lost plants, not having been rediscovered since his day.

We will now give an enumeration of the 41 species of Stapelieae as introduced by MASSON in this volume, with the names under which they are known nowadays between brackets. Of each species the habitat as given by MASSON will be quoted, though of 15 species no precise localities are mentioned (merely "In Africa Australi" (S. A.), sometimes with the statement that the pictured species was found in dry regions—occasionally the "Karro" is referred to—added to it). As far as the species have been rediscovered, the districts where they were found by later collectors will be mentioned[160]. Of most of the species MASSON gives the year they were flowering in his garden at the Cape, and not when they were found (which is difficult to guess). Of two species only he informs us in which year they were collected. MASSON'S lost Stapelieae are marked with an asterisk.

1. Stapelia ciliata, Thunb. (*Diplocyatha ciliata,* N. E. Br.). This species was discovered by THUNBERG in very arid regions, Karroo, between the Roggeveld and Paardeberg (*Flor. Cap.* (1823), p. 240), which is in the Ceres district. MASSON, who accompanied THUNBERG on the journey to the Roggeveld (Sept.–Dec., 1774) found it in very dry places below the "Boekland" (Bokkeland!) Berg, and both give as the flowering season November and December. His remark "in loco natali delineata 1774", drawn in its native habitat, we find added to none of the other descriptions, and as this eliminates any doubt that MASSON himself was the artist, we have chosen this first illustration in *Stapeliae Novae* to be reproduced herewith (Plate IX). The original drawing, as mentioned before, is in the British Museum. The "fringed Diplocyatha" is now also known from the Calvinia, Beaufort West, Prince Albert, and Ladismith districts of the Cape. *Diplocyatha,* N. E. Br., is a monotypic genus.

2. Stapelia reticulata, Mass. (*Huernia reticulata,* Haw.), a plant discovered by MASSON in small cavities of rock towards North Olifants River (= Clanwilliam district). He writes that it flowers in the spring

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[160] For precise localities see WHITE & SLOANE, *The Stapelieae* (1937).

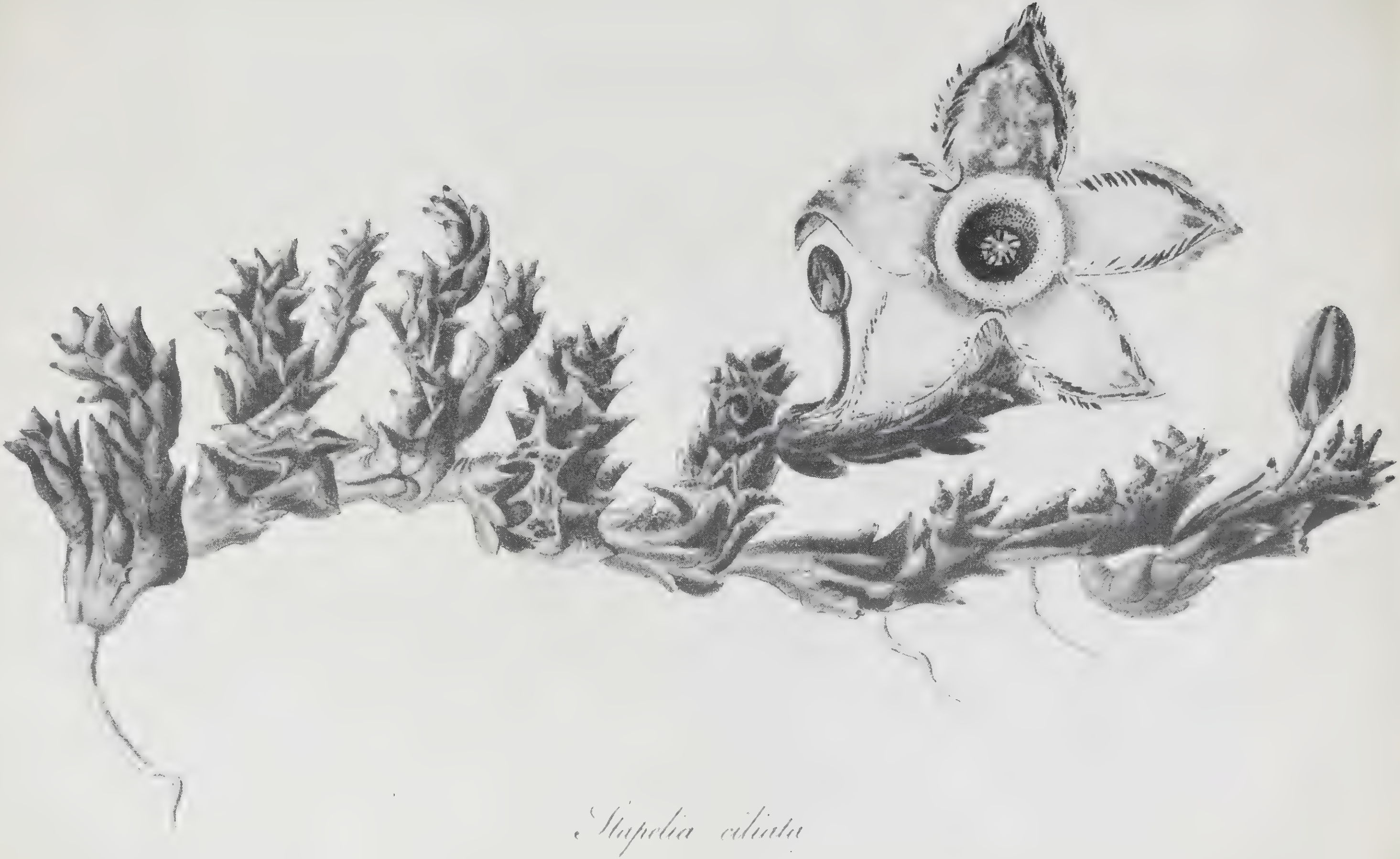

Plate IX. *Diplocyatha ciliata*, N. E. Br. (Stapelia ciliata, Thunb.).
From an illustration (Plate I) in Francis Masson, *Stapeliae Novae* (1796).

and in the autumn. By later collectors also found in the Van Rhynsdorp district.

3. *Stapelia venusta, Mass. (*Huernia venusta*, R. Br.): discovered by Masson in arid regions, viz. the Karroo. This *Huernia* is only known from Masson's picture in *Stapeliae Novae*, and has not been found again.

4. Stapelia guttata, Mass. (*Huernia guttata*, R. Br.): discovered by Masson in dry places, but no precise locality is given. The "speckled Huernia" was lost to cultivation for a century and a quarter, and was rediscovered by the late Dr. G. C. Nel. It is now known from various localities, viz. in Bushmanland, the Clanwilliam and Van Rhynsdorp districts, while it is also found between Willowmore and Port Elizabeth, and in S.W. Africa.

5. Stapelia humilis, Mass. (*Huernia humilis*, Haw.). As to its habitat, Masson, who discovered it, says it grows in dry places. It was later found in the Beaufort West and De Aar districts.

6. Stapelia campanulata, Mass. (*Huernia campanulata*, R. Br.): discovered by Masson, who, writing about the habitat of this species, only mentions that it grows in dry places. There is little doubt that the Great Karroo was referred to, as it was later found in the Prince Albert district. Further it is widespread in the Ladismith and Oudtshoorn districts.

7. Stapelia barbata, Mass. (*Huernia barbata*, Haw.). Masson, who discovered the species, does not give a locality. It was found by later collectors in many places in the Cape Province, i.e. in the Aliwal North, Lady Grey, Prince Albert, Somerset East, Ladismith, Uitenhage, Willowmore, and Albany districts. It is also known from Fauresmith in the Free State. A widely distributed species! The pictured plant flowered in Masson's garden at the Cape in March, 1794. As to its specific name, we may quote White & Sloane[161]:—"Francis Masson was often very happy in his choice of names for his Stapeliads. His designation of the present species . . . the 'bearded Stapelia' . . . , is a typical instance of his careful sense for nomenclature. Once the flower has been seen (with its papillate inner corolla surface, and the papillae tipped with long clavate purple hairs from below mid-tube to the base or even the middle of the lobes), the name *H. barbata* will never be applied by the collector to any other plant."

8. *Stapelia verrucosa*, Mass.: discovered by Masson, who writes that its habitat is in dry places. No precise locality is given. He further informs us that it flowers in September and October. This is a known species, but Masson's original type has never been rediscovered. There are several varieties, widely distributed at the Cape, from Grahamstown to Griqualand West. One of the best known members of the genus!

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[161] White & Sloane, *The Stapelieae*, Vol. III (1937), p. 952.

9. **Stapelia irrorata*, Mass. MASSON, who discovered the species, says that it is found in dry places, and flowers in September and October. He does not mention the precise locality. This is another of the vanished species.

10. *Stapelia revoluta*, Mass. MASSON discovered this species in dry veld under shrubs in the Karroo beyond North Olifants River (these are the western karroid areas in the Clanwilliam district). As stated by him, it flowers in September and October. This species was later also found in the Van Rhynsdorp district.

11. *Stapelia grandiflora*, Mass. MASSON discovered this species, one of the most striking Stapelias we owe to him, in warm places near the Sundays River. It flowered in his garden at the Cape in 1792. Apart from MASSON's locality, which is in the Uitenhage district, it is known from many other places, i.e. near Alexandria, Bathurst, Port Elizabeth, Somerset East in the Eastern Cape; the Prince Albert district, and also the Lydenburg district in the Transvaal. Also found in Swaziland.

12. *Stapelia ambigua*, Mass. MASSON, who discovered this plant, says that its habitat is in arid deserts, and that it flowered in his garden at the Cape in March, 1794. It was later found in the Victoria West and Uitenhage districts of the Cape.

13. *Stapelia pulvinata*, Mass. This species was discovered by MASSON on the Kamiesberg (= Little Namaqualand), amongst shrubs. He says that it is called by the inhabitants "Arabisch Rose" (Arabian R.), and that it flowered in his garden at the Cape in 1792. It was found by later collectors at other points in Little Namaqualand, including Springbok.

14. **Stapelia asterias*, Mass. This species was discovered by MASSON in the Karroo, but no precise locality is given. It flowered in his garden at the Cape in 1792. This is another of the vanished species.

15. *Stapelia gemmiflora*, Mass.: discovered by MASSON in arid places amongst bushes beyond Plattekloof (= Riversdale district). It flowered in Kew Gardens in October, 1796. The "gemflowered Stapelia" was found by later collectors, and it proved to be widely distributed in the Cape Province, incl. Swellendam, Laingsburg, Riversdale, Willowmore, Uniondale, Ladismith, Prince Albert, Steynsburg, Graaff-Reinet, Middelburg, De Aar, and Aliwal North districts. It has also been collected in the Free State (Fauresmith district).

16. **Stapelia vetula*, Mass. This species was discovered by MASSON in the mountains near Hex River (= Worcester district), but was never found again.

17. **Stapelia acuminata*, Mass. MASSON discovered this species in Namaqualand (= Little N.), but he does not give the precise locality.

The water-colour must have been made of a plant flowering in his garden at the Cape in 1791. This too is one of MASSON's lost plants.

18. *Stapelia concinna*, Mass. This is one of the long-lost plants of MASSON, who first collected it in dry places in the Karroo, but did not give the precise locality. He says that it flowered in his garden at the Cape in 1794. A variety of this species, *S. concinna* var. *paniculata*, N. E. Br., was rediscovered about 1930, growing on shales, near the bank of the Doorn River, about 50 miles north-west of Calvinia.

19. *Stapelia glanduliflora*, Mass.: discovered by MASSON in deserts near North Olifants River (= Clanwilliam district). It flowered in Kew Gardens in October, 1796. This *Stapelia* was later found also in the Van Rhynsdorp district (near Klaver). It is a native of the dry areas near the west coast of the Cape Province, 100 miles or more above Cape Town.

20. *Stapelia rufa*, Mass.: discovered by MASSON in warm places beyond Plattekloof (= Riversdale district). It was later found in many more places, i.e. in the Little Karroo, north of Garcia's Pass (Riversdale district), and also in the Laingsburg (near Matjesfontein), Prince Albert, and Ladismith districts. It flowered in his garden at the Cape in 1793.

21. *Stapelia pedunculata*, Mass. This species, characterized by very long pedicels (hence the name), was discovered by MASSON in arid regions near the Kamiesberg (= Little Namaqualand). It flowered in his garden at the Cape in 1792. It was later collected also near O'okiep and in the Richtersveld (Little N.).

22. *Stapelia divaricata*, Mass. MASSON, who discovered the species, does not say anything about the locality. He only mentions that it flowered in his garden at the Cape in 1792. Later collectors found it in the Swellendam district.

23. Stapelia pilifera, L. f. (*Trichocaulon piliferum*, N. E. Br.). This species was discovered by THUNBERG in 1773, who writes that it grows in the Karroo at the other side of "Hartequas" (Attaquas!) Kloof, and below the Roggeveld (*Flora Cap.* (1823), p. 239). This is the Little Karroo, inland from Mossel Bay (Oudtshoorn district). MASSON, who was THUNBERG's fellow-traveller on this journey into the interior, writes that its habitat is in the deserts of S. Africa, on very dry hills, under shrubs, and in the Karroo below the Roggeveld Mountains. It is stated by THUNBERG that this species flowers in August and September. MASSON n his work says that the plant flowered in his garden at the Cape, but he does not give the year. *T. piliferum* is fairly frequent still at numerous points in the southern karroid areas. It is known from the Prince Albert, Calvinia, Sutherland, Riversdale, Ladismith, Swellendam, Willowmore districts. It has been also found in Great Namaqualand (S.W. Africa).

The "hair-bearing Trichocaulon" was the first species of the genus to be discovered, but the genus itself was not established until more than a century later. MASSON writes that it is used as a medicine by the Hottentots, by whom it is called "guaap" (also spelt "gaap" and "ngaap").

24. Stapelia punctata, Mass. (*Piaranthus punctatus*, R. Br.). MASSON, who discovered the plant, mentions as its habitat Namaqualand (= Little N.). It flowered in his garden at the Cape in 1790, so it was presumably collected on his journey to the Kamiesberg in 1789. The "dotted Piaranthus" was later found also in the Laingsburg and Van Rhynsdorp districts.

25. Stapelia geminata, Mass. (*Piaranthus geminatus*, N. E. Br.). MASSON discovered this species in hot regions of S. Africa under shrubs, but no precise locality is given. It was later rediscovered in the Jansenville district of the Cape Province. The pictured plant flowered in his garden at the Cape in February, 1794.

26. Stapelia decora, Mass. (*Piaranthus decorus*, N. E. Br.). MASSON, who discovered this plant, just mentions S. Africa as its habitat. It flowered in his garden at the Cape in 1794. After having been lost for a long time, the species was rediscovered in the Swellendam, Oudtshoorn and Ladismith districts.

27. Stapelia elegans, Mass. (*Duvalia elegans*, Haw.): discovered by MASSON in the Karroo; no precise locality is given. It flowered in his garden at the Cape. Later collectors found this species in the Robertson, Port Elizabeth, and Oudtshoorn districts.

28. Stapelia reclinata, Mass. (*Duvalia reclinata*, Haw.). MASSON, who discovered the species, only says that its habitat is in S. Africa, and that it flowered in his garden at the Cape. It was later found in various places, i.e. in the Graaff-Reinet, Aberdeen, Uitenhage, Jansenville, Cradock, and Willowmore districts of the Cape.

29. Stapelia caespitosa, Mass. (*Duvalia caespitosa*, Haw.): discovered by MASSON who found it growing in Karroo regions, under bushes. It flowered in his garden at the Cape in 1793. It is known to have been rediscovered near Port Elizabeth, and it is supposed also to grow in the Victoria West district.

30. Stapelia articulata, Ait. (*Pectinaria articulata*, Haw.). This species was discovered by THUNBERG near the Roggeveld mountains at the end of November, 1774[162]. MASSON, who was his fellow-traveller on this journey, writes about this species that its habitat is in the Roggeveld, and that its stems preserved with vinegar are used as a medicine by the

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[162] THUNBERG introduced this plant under the name "Stapelia articulata repens" (*Travels*, etc., Vol. II of 3rd ed., p. 171 (1796). See also this Journal, Vol. V, Oct., 1939, p. 151.

"Novaccolis" (colonists), and also, but untreated (raw), by the Hottentots. The distribution is not further known.

31. Stapelia pulla, Ait. (*Caralluma mammillaris*, (L.) N. E. Br.). This is one of the very early Stapelieae in cultivation. J. BURMAN has a drawing of it in his *Decades*, etc. (1738). MASSON found the plant in warm, dry places in the Karroo, but he does not mention the precise locality. It was later collected in many places in the Cape Province, viz. in the Oudtshoorn, Prince Albert, Laingsburg, Worcester, Ceres, Clanwilliam, and Van Rhynsdorp districts. It is also known from Little Namaqualand, including the Richtersveld. MASSON informs us that the specimen(s) he had collected, flowered in March, during the voyage from the Cape to St. Helena. This must have been in 1795 on his way back to England.

32. Stapelia ramosa, Mass. (*Caralluma ramosa*, N. E. Br.). MASSON discovered this plant in Karroo regions beyond Plattekloof (= Riversdale district), "around the hot springs". It flowered in his garden at the Cape in August, 1792. It was found by later collectors at many points in the Swellendam, Riversdale, Laingsburg, Ladismith, and Prince Albert districts. The species is quite common in the southern Karroo, growing on the shales among other succulents from 1,000 to 1,400 feet altitude.

33. *Stapelia arida, Mass. (*Caralluma arida*, N. E. Br.): discovered by MASSON "in dry deserts in Kanna Land", by which he meant the south-western part of the Little Karroo (Riversdale or Ladismith district). This species has not been rediscovered since his day.

34. Stapelia incarnata, L. f. (*Caralluma incarnata*, N. E. Br.). This is one of the first Stapelieae to become known in Europe. It was figured in J. BURMAN'S *Decades*, etc. (1738) and was known to both THUNBERG and MASSON. The former informs us (*Flora Cap.* (1823), p. 240) that it grows at Saldanha Bay, in the mountains near "Compagnies Post" (which is in the Malmesbury district), and also near Verloren Valley (= Piquetberg district). Further it is stated by him that it flowers in August and the following months. MASSON found this species in "dry and arid veld", but does not give the locality. It was later also collected in the Ceres district, Little Namaqualand (Richtersveld).

35. *Stapelia parviflora, Mass. (*Caralluma parviflora*, N. E. Br.). MASSON discovered this species in regions of Namaqualand (= Little N.), growing under shrubs. It flowered in his garden at the Cape, and is one of the eight species first collected by him, which have remained unrediscovered since his day.

36. *Stapelia pulchella*, Mass.: discovered by MASSON, who does not mention any localities. It flowered in his garden at the Cape in 1793.

Later collectors found it in the Uitenhage, Port Elizabeth, Humansdorp, and Alexandria districts in the Eastern Cape.

37. Stapelia aperta, Mass. (*Caralluma aperta*, N. E. Br.). This species was discovered by MASSON in Little Namaqualand near "Kok Fontein" (Kokfontein, south of the Zwart Lintjes River). It is now known from various places in Little Namaqualand, i.e. Springbok and the Richtersveld.

38. Stapelia mixta, Mass. (*S. variegata* var. *mixta* (Mass.) N. E. Br.). MASSON, who discovered the species, only says that it is found in S. Africa. It was rediscovered in the Robertson district of the Cape Province. MASSON informs us that the plant flowered in Kew Gardens in 1796. His painting must have been made from that specimen.

39. **Stapelia sororia*, Mass. This is the last of MASSON's lost Stapelieae. He only states that S. Africa is its habitat, and that it flowered in his garden at the Cape in 1792, and at Kew in June, 1797.

40. Stapelia Gordoni, Mass. (*Hoodia gordoni*, Sweet). From MASSON's notes on this species we may quote here in English translation:—"This unique species of Stapelia I have neither seen nor examined. For the [original] copy from which the picture has been made, I have to thank the favour of Mr. Gordon. I have considered [its] place in this collection to be worth an engraving, since it leads to further investigations of the species of this remarkable genus, which I believe to be indeed numerous".

"Gordon's Hoodia", the type species in this genus, was discovered by Col. GORDON, probably in the year 1779, in the Great Namaqualand country (S.W. Africa) on the north side of the Orange River. Now it is known from various localities in S.W.A.; from Little Namaqualand (i.e. near Henkries, 12 miles south of the Orange R.), the Prieska and Griqualand West districts, etc.

In the 2nd edition of his *Hortus Britannicus* (1830), ROBERT SWEET transferred the species to the new genus *Hoodia*, Sweet.

41. Stapelia pruinosa, Mass. (*Caralluma pruinosa*, N. E. Br.). This plant was first collected by MASSON in dry regions, under shrubs, in Namaqualand (= Little N.), but no precise locality is given. He writes about this plant (transl.):—"This beautiful little species flowered in Kew Garden in June, 1797, after the last number of my little work had been sent to press, and I thought botanists would be pleased to have me figure the species, whose flower I never saw while I was in Africa." It was later rediscovered in other places in Little Namaqualand.

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There is very little doubt that MASSON was the artist of most of the drawings from which the plates in *Stapeliae Novae* were made. As mentioned before, Col. GORDON too, whom MASSON met at the Cape, was a skilled draughtsman. JAMES BRITTEN in an article on GORDON[163] writes that in the sale of the STAFFORD Library at SOTHEBY'S, London, in November, 1913, there were included a collection of 400 water-colour drawings made by GORDON in South Africa from 1777 to 1790. These include pictures of natives, quadrupeds, birds, reptiles and plants as well as plans and views of the district round the Cape and the Orange River. According to BRITTEN, the drawings are evidently extremely accurate. A number of these are furnished by GORDON with descriptions in Dutch[164]. The early history of GORDON'S collection of papers and drawings is given in a letter to Sir JOSEPH BANKS, dated May 27, 1797, from PHILIP GIDLEY KING (1758–1808), who at the time of writing was Lt.-Governor of Norfolk Island, but was then in London. BRITTEN gives a full transcript of this letter, of which the following is of special interest:— "The second Box contains a very full and large Book, in which are arranged upwards of 400 drawings of Natural History, appropriate to the Charts and Views. The Charts and Natural History Mrs. Gordon informs me were all designed by her own husband, who drew every outline, and had them finished under his own eye". Who was the man employed by GORDON, who did the colouring, shading, etc. of the drawings? It does not seem likely that it was SCHUMACHER (see p. 18) who finished some of GORDON'S drawings, though he could have done so in 1777. We have not any record of GORDON having met SCHUMACHER. PATERSON in his *Narrative of Four Journeys*, etc. (1789) tells us that "a draughtsman of Captain Gordon's, who was in the wagon, had his thigh bruised", a remark which makes Mrs. GORDON'S statement regarding the execution of her husband's drawings the more credible. PATERSON can be ruled out forthwith as another possibility. As pointed out by DYER[165], there is ample evidence that PATERSON was indebted to GORDON for the greater part of the illustrations in his *Narrative*. DYER in his paper refers to several plates in PATERSON'S work and some paintings in PATERSON'S *Collection of Drawings ex Libris Oppenheimer*, Johannesburg, which are matched in the GORDON collection, and he gives reproductions of both GORDON'S and PATERSON'S originals. For instance, the original drawings of PATERSON'S illustrations of the peculiar *Pachypodium namaquanum*, Welw. (one of the "Pentandria monogynia"); the inflorescence of *Aloe dichotoma*, Mass.; and *Sarcocaulon burmanii*, Sweet ("Geranium spinosum") are all in GORDON's collection. DYER definitely does not fall in with MUIR's high opinion of PATERSON as an artist (see footnote 90!), though it should not be ruled out altogether that he was a draughtsman: the illustrations of landscapes and buildings in his *Narrative* might have been his own work.

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[163] J. BRITTEN, *Robert Jacob Gordon*, Journ. of Bot., Vol. LII, 1914, p. 75.

[164] We may recall that GORDON was born in Holland, where he was in active service previous to his first visit to the Cape in 1773 (see footnote 92).

[165] R. A. DYER, *Col. R. J. Gordon's Contrib. to S.A. Bot.*, Repr. from S.A. Biol. Soc. Pamphlet No. 14, 1949.

The GORDON collection put up for sale at SOTHEBY's was purchased by Messrs. MAGGS BROS. for £690, and then offered for sale at almost double the price, viz. £1,250. The collection, including over 100 paintings of South African plants, was bought by a committee in Holland, and is housed in the Rijksmuseum at Amsterdam.

We were so fortunate as to obtain photographic copies of all Stapelieae paintings in the GORDON collection. We found that nine of the species drawn by GORDON are represented in MASSON's *Stapeliae Novae*, viz. *Huernia campanulata* and *barbata; Stapelia irrorata*, *pulvinata*, *gemmiflora*, *pedunculata* and *pulchella; Pectinaria articulata*, and *Hoodia gordoni*. Another of GORDON's drawings is of a *Stapelia* sp., which, according to WHITE & SLOANE, may be identical with *S. glandulifera*, a species depicted by MASSON. All but two of these drawings are different from MASSON's. These two match exactly with Plates 13 and 40, viz. of *Stapelia pulvinata*, and "Stapelia Gordoni" (*Hoodia gordoni*), in *Stapeliae Novae*. In the GORDON collection there is a second painting of *S. pulvinata*, almost identical, which GORDON may have prepared or had prepared to give away. We have already seen that MASSON himself says that the illustration of "S. Gordoni" was made from a painting he received from GORDON. A comparison of Plate 40 with the photograph of the original does not leave the slightest doubt about this. The picture shows the inscription "Stapeelia" (Dutch spelling!) in GORDON's hand.

In the GORDON collection there are two nearly identical paintings of *Pectinaria articulata*, quite different from Plate 30 in MASSON's volume. One of them shows a description in Dutch, written down by GORDON. After having given the name of the plant figured as "Stapelia nigrum", he writes:—"[?] aap. een vrugt uit de caro. eetbaar. Sappig" (transl.: [?] aap (we cannot decipher the initial, but the word meant obviously is ngaap or gaap, the Hottentot name for this fruit), a fruit from the Karroo, edible, juicy).

As counterpart of a reproduction of one of MASSON's *Massonia* drawings, viz. of *M. pustulata*, Jacq., we may now present the only *Massonia* painting in the GORDON collection (Plate X). This interesting drawing is inscribed with the name "Massonia Latifolia". According to DYER, to whom we are indebted for a photograph of this drawing, it is quite likely that GORDON's drawing illustrates the type of *M. latifolia*, L. f. (the very first species of the genus discovered), though he cannot give absolute

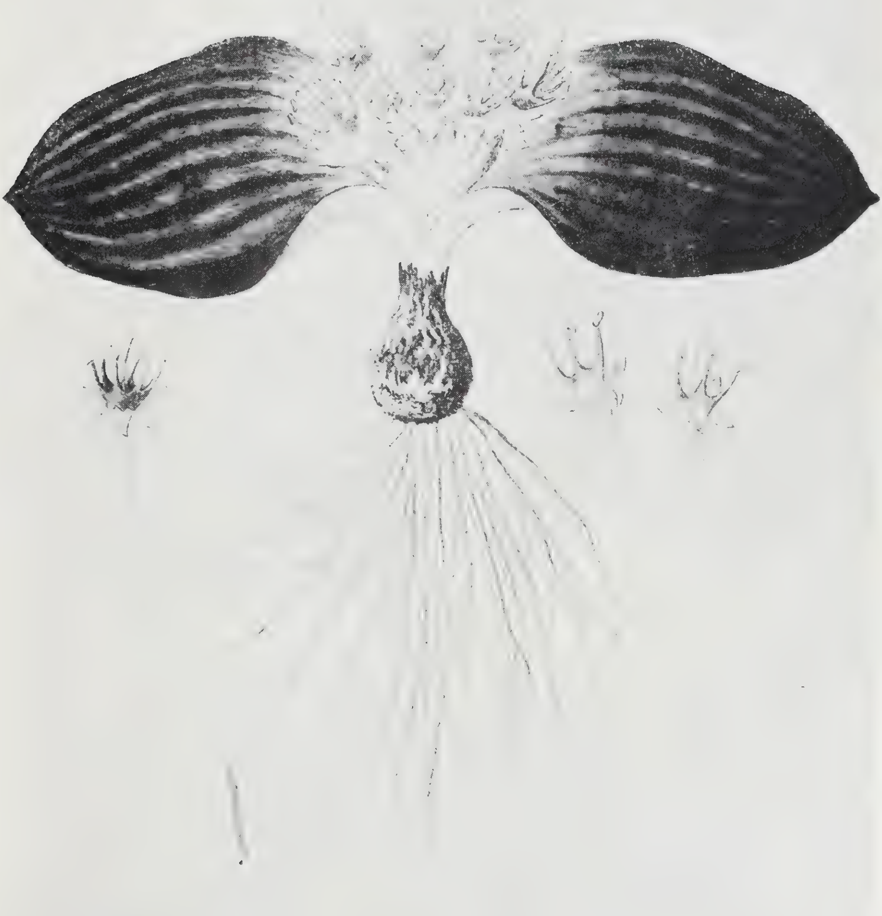
Maſsonia Latifolia.

Plate X. *Massonia ?latifolia*, L. f.
From a drawing by Col. R. J. Gordon. By permission of the Rijksmuseum, Amsterdam.

confirmation of this. The two drawings show a marked difference in draughtsmanship.

We have now reached the end of our account of the life and work of the gardener-botanist FRANCIS MASSON, with special reference to his achievements as a collector at the Cape. Both botanical science in South Africa and horticulture in Europe have greatly benefited by his painstaking work as a botanist and as a collector. The foregoing clearly shows the importance of MASSON's contribution to the knowledge of South African botany, and we can but be grateful for the volume he left to posterity, *Stapeliae Novae*, a work of great merit and value, both for the accurate, true-to-life drawings, from which the plates were made, and the detailed descriptions of the plants figured, which show him as a keen observer. This publication stands out as the very first volume wholly devoted in words and pictures to this highly interesting group of succulent plants.

Regarding his introduction of Cape plants into cultivation in England, we cannot do better than quote what THUNBERG writes about this in the author's preface of his *Flora Capensis*[166]. Having stated that MASSON was his fellow-traveller on his journeys into the interior of Africa towards the east and the north, THUNBERG says: " . . . he obtained in particular seeds of plants, bulbs, and succulent stems, for despatch to England. With these he has enriched in a wonderful manner, most laudably, the *Kew* Garden. Afterwards he visited the Cape of good hope again, and undertook lengthy journeys [on which] he discovered not a few new things [plants]". THUNBERG could not have been more appreciative indeed. Judging from his letters to THUNBERG and the account of his journeys, MASSON could get along well with the brilliant Swedish botanist, the father of South African botany, and greatly respected him.

ADDENDA.

MASSON'S CORRESPONDENCE.

Some time after we had completed the first parts of our paper we accidentally came to know about two MASSON letters in the custody of the Library of the Royal Academy of Science in Stockholm. The former

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[166] C. P. THUNBERG, *Flora Capensis*, ed. Schultes (1823). In the Praefatio Auctoris, under the heading *Botanici et Collectores, qui ipsi hocce promontorium salutarunt* (transl.: Botanists and Collectors who themselves have visited this cape), THUNBERG gives some notes on MASSON's work at the Cape. The original Latin text of this quotation reads as follows (p. X): " . . . plantarum praecipue semina, bulbos et succulentos caules, in Angliam mittendos, attulit, eisque mirum in modum, Hortum *kewensem* laudabiliter ditavit. Postea Caput bonae spei iterum visit, longinqua instituit itinera et nova non pauca detexit".

Librarian, Dr. Arne Holmberg, kindly drew our attention to these letters.

The first letter was written by Masson from London (after his first visit to the Cape) to the outstanding Swedish botanist P. J. Bergius[167], on December 27, 1775, the second one, dated June 12, 1776, and written in French, is Bergius' answer to that. Both letters are transcripts. Thanks to photographic copies which we were presented with, they can be reproduced here in full.

1. Masson to Bergius.

Sir Ex orig.

I hope your generosity will pardon the freedom I have taken in adressing myself to you, with whom I have not the honour to be aquainted; But well knowing your great Merit in Botany and Natural history I have taken this favourable oportunity of makeing myself known: I had the honour to be sent by his Brittanic Majesty on an Expedition to the Cape of good Hope, to collect Plants for his Botanic Garden at Kew, where I had the honour of an intimat aquaintance with our worthy friend Dr. Thunberg, where we contracted a mutual friendship and made several long journies into the interior parts of Africa. At his departure he delivered to me some parcels of dried plants for you, which I delivered to Mr. Lindegren, to be send to Sweden, which I hope you have received. Since my arrival upon examining my Cape Plants I think I have found the *Bergia capensis*[168], and thinking it might be still a scarce Plant or perhaps not yet fallen into your hands, I have sent you a Specimen thereof, and should be glad to know your oppinion of it, or if I am right in my determination. I expect soon to go upon another expedition, to another part of the world[169], and if I am fortunat to discover any thing new I should be happy to have the honour of communicating it to you. I should be glad to know if you have heard latly from Mr. Thunberg, if you writ him soon, let my beg my sincere respects to him, which will greatly oblige Your most obedient,

humble Servant,

London Dec^{r}. 27. 1775. Fran^{s}. Masson.

direct to M^{r}. Francis Masson at M^{r}. James Lee's Nursery-man at Hammersmith London.

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[167] Peter Jonas Bergius (1730–1790), a doctor of medicine and professor of natural history at Stockholm, was one of Thunberg's best friends and helpers at home. He is the author of a modest little book on Cape plants, which may be considered as the first flora of the Cape: *Plantae Capenses* (Stockholm, 1767). See also this Journal, Vol. V, July, 1939, pp. 92–3 (with portrait), and M. Karsten, *The Old Company's Garden at the Cape* (1951), pp. 137–40 (with reproduction of title page of *Plantae Capenses*).

[168] *Bergia capensis*, L. is the type species of the gen. *Bergia*, L., belonging to the Elatinaceae or Water-wort family. The Bergias are prostrate, rarely erect, herbs or undershrubs, often pubescent. The flowers are axillary, sessile or pedicilled, solitary or in fascicled cymes (Phillips). Apart from *B. capensis*, there are another two species indigenous to S. Africa.

[169] Madeira, the Canaries, the Azores, the West Indian Islands!

2. BERGIUS TO MASSON (transl.).

Sir, Ex orig.

Never have I had a more pleasant surprise than when I received your letter, Sir, with a specimen of Bergia, a plant so rare that my friend Thunberg had not been able to find it during the whole time that he was living at the Cape of Good Hope. Never was there a more appropriate compliment. You can well imagine with what diligence I have tried to obtain a plant which bears my name in order to place it in my herbarium, and consequently how great an obligation I owe you for a gift so precious to me. Yes, Sir, I am filled with the greatest possible appreciation and wish nothing more fervently than to have favourable opportunities to render every imaginable service to a man who has so clearly shown his fine and generous character. In return I shall be glad to search for any natural history objects which may be found in these parts, in which you may be interested, and you have only to ask as much as you please. Oh, how happy I should think myself if I could thereby earn the continuation of your friendship, so that in future, when you might be in a position to contribute even more fully to my herbarium, as you no doubt already are, you would be kind enough to remember me and my wishes, which are only too keen in respect of rare and new plants, as in fact is quite natural for every botanist. In fact, Sir, you have caused me very great pleasure by the generous promise you have given to be good enough to send me new plants which you may come across in the botanical expedition which you are about to undertake. May the Almighty prosper you in all your ways, Sir, and bring you back safe and sound, enriched by many interesting discoveries. But before I conclude, I should like to know your London address, so that I can write to you sometimes and at the same time have news of you during the course of your journey, and so that anything which I may be in a position to send you from here may be able to reach you safely. I have a small collection of Lapland plants which I could send you to begin with. We have had no news of our friend Thunberg since he left the Cape, but we have every hope that he is still alive and well. I have had the opportunity to secure some practical monetary assistance for him from our Academy, which he will doubtless need. This faithful friend, while at the Cape, regaled me from time to time with a number of very rare plants, among which was a Massonia, but as it was eaten by worms en route I should very much like to have another and more complete specimen. May I beg you, Sir, to be good enough to gratify my wish? To return to the rare plant which you have just sent me, it is in truth a genuine Bergia, agreeing with the Bergia of Linnaeus by its 10 stamens and 5 pistils, and Mr. Linné to whom I had first the opportunity of showing it, did not hesitate to agree, but he at once exclaimed that it was a new species of this genus, and for that reason he asked me for one of the two pieces which you had sent me so that he could describe it in his new Mantissa, and this I could not refuse him. Thus, Sir, you have the credit of having enriched this genus with a second species; but as for the first, namely Bergia capensis, this has not yet reached me. Perhaps you could also find this among your excellent collection of Cape plants, and perhaps even in duplicate, so that you might have the means of charming me with it! I have the honour to be, with profound esteem, Sir,

Your very humble and obedient servant
P. J. Bergius.[170]

Stockholm
12 June 1776.

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[170] Orig. French text: "Monsieur, Jamais surprise ne m'a été plus agréable, que celle qui m'arrivoit en recevant vôtre lettre, Monsieur, avec un exemplaire de Bergia, plante si rare, que mon ami Thunberg n'avoit pas été capable de la trouver durant tout le tems qu'il sejournoit au Cap de bonne Esperance. Jamais galanterie ne fut-elle mieux placée. Vous jugerés bien, avec quel empressement j'ai dû rechercher une plante qui porte mon nom, pour pouvoir l'inserer dans mon herbaire, & après cela au quel point je vous aie de l'obligation d'un don, qui me fut si précieux. Oui, Monsieur, j'en suis pénétré de la plus vive reconnoissance du monde, & je ne souhaite rien plus ardemment, que d'avoir des occasions favorables de rendre tous les services imaginables à un homme, qui a si bien signalé son caractere noble & bienfaisant. Effectivement je m'offre à rechercher pour vous de toutes les choses naturelles qui se pourront trouver dans ces cantons, supposé que vous en seriés curieux, & vous n'avés qu'à en demander autant qu'il vous plaira. O que je m'estimerois heureux, si avec cela je pouvois meriter la continuation de vôtre amitié, de sorte que desormais, lorsque vous seriés en état de fournir à mon herbaire un accroissement bien plus ample encore, comme vous l'êtes sans doute deja, vous voulussiés bien vous souvenir de ma personne & de mes desirs, qui ne sont que trop ardens par raport aux plantes rares & nouvelles, come en effet cela est bien naturel à tous les botanistes. Actuellement, Monsieur, vous m'avés fait une joie extreme par la promesse genereuse que vous m'avés donnée de vouloir bien me communiquer des plantes nouvelles, qui se pourront présenter dans l'expedition botanique, où vous allés vous engager de nouveau. Que le Tout-puissant fasse prosperer toutes vos vuës, Monsieur, & que vous puissiés revenir sain & sauf, enrichi de nombre de decouvertes interessantes. Mais avant que de partir, je vous demanderai vôtre adresse à Londre, afin que je puisse vous écrire quelquefois, & même avoir de vos nouvelles pendant le cours de vôtre voyage, & que les choses, que je serois en état de vous envoyer d'ici, vous puissent parvenir sûrement. J'ai une petite collection de plantes Lapponiques, que je pourrois d'abord vous envoïer. Nôtre ami Thunberg ne nous a pas donné de ses nouvelles depuis qu'il quittoit le Cap, mais nous avons pourtant lieu d'espérer qu'il vivra encore & qu'il se trouvera bien. J'ai eu l'occasion de lui procurer quelque assistence réelle de nôtre Academy avec de l'argent, dont il aura sans doute besoin. Cet ami fidel, étant au Cap, me regala de tems en tems de nombre de plantes très rares, & entre autres aussi d'une Massonia, mais comme elle avoit été rongée sur le chemin des vers, je souhaiterois fort d'en avoir un autre exemplaire, qui fut plus accompli. Ose-je vous prier, Monsieur, de m'en vouloir bien gratifier? Pour revenir à la plante rare que vous venés de m'envoyer, elle est à la verité une vraie Bergia, repondante à Bergia Linnaei par ses 10 étamines & ses 5 pistilles, & Mr. Linné, à qui j'avois d'abord occasion de la montrer, ne laissa pas d'en convenir, mais il s'écria aussi-tôt que c'étoit une nouvelle espece de ce genre, & pour cela il me demanda l'un des deux exemplaires que vous m'aviés envoyés, pour la pouvoir decrire & inserer dans sa nouvelle Mantisse, ce que je nu pus pas lui refuser. Vous avés donc,

Your letter has only reached me recently and it has not been possible to answer it sooner.

As for the dried plants which you have entrusted to Mr. Lindegren, for delivery to me, I have not yet received them.

The publication of Part III of our paper in the October, 1959 issue of this Journal, in which several letters MASSON wrote to BANKS are cited, induced the Librarian of the Sutro Branch of the California State Library, Mr. RICHARD H. DILLON, to provide us with the following interesting information about the history of the BANKS letters and other items in the custody of that library.

The BANKS papers came to the California State Library with the entire Sutro Library (some 100,000 books), the gift to the State of California by the heirs of pioneer bibliophile ADOLPH SUTRO, Mayor of San Francisco. Apparently Mr. SUTRO or one of his agents bought the 10,000 BANKS Manuscripts at auction in England (probably at SOTHEBY'S) in the 1880's.

Mr. DILLON further writes that the manuscripts are not all catalogued, by any means, and that more African material might turn up in the future. Poor housing and an overworked staff have kept them from completing the cataloguing of this fine collection, but should they move to the adequate housing promised them, they will find time to round out this project.

Will the lost originals of MASSON'S letters to BANKS of January 21, and March 8, 1786, sent from the Cape, turn up after all? Judging from the above information, the possibility should not be ruled out altogether. However, at about the same time we had a letter from Miss EDWARDS of the British Museum (Nat. Hist.), dealing with another set of MASSON letters, and this is what she writes:—

"The originals of 61 letters from Francis Masson to Banks between 1776 and 1800 are in the Mitchell Library, Sydney. Of these 39 are dated from Cape of Good Hope, but the two you specify—those of 21 Jan. and

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Monsieur, le merite d'avoir enrichi ce genre d'une seconde espece; mais pour la premiere, savoir Bergia capensis, elle ne m'est pas encore parvenuë. Puissiés vous la trouver aussi parmi vôtre excellente collection des plantes du Cap, & cela in duplo, afin que vous eussiés moïen de m'en regaler! J'ai l'honneur d'être avec l'estime la plus parfaite, Monsieur, Vôtre très humble & très obëissant serviteur

P. J. Bergius.

de Stockholm
le 12. Juin 1776.

Vôtre lettre ne m'étant parvenuë que nouvellement, il ne m'a pas été possible d'y repondre plus-tôt.

Pour les plantes seches, que vous avés confiées à Mr. Lindegren pour être transmiser à moi, je ne les ai pas encore reçuës.

8 Mar. 1786, are not among them. Probably these two are strays from Masson's file and so got into the general correspondence copied in D.T.C. If so, there is little hope of tracing the originals as most, if not all, the general letter books were bought by dealers who broke them up to get the letters valuable as autographs and destroyed most of the rest."

By D.T.C. is meant DAWSON TURNER Collection (consisting of transcripts of the original letters; see this Journal, Vol. XXV, Oct., 1959, p. 283, footnote 88).

Those letters from the Cape may provide interesting additional information *re* MASSON's activities during the period of his second sojourn (1786–95) in the country.

MASSON'S PLANTS.

Since part IV of this paper, dealing with the whereabouts of MASSON's plants, was published, we received a letter from Prof. Dr. CHARLES BAEHNI, Director of the Conservatoire et Jardin Botaniques at Geneva, where the DELESSERT Herbarium is housed. Prof. BAEHNI writes that the Herbarium referred to has been part of this institution for about 110 years, and that full particulars about it are given in LESÈQUE, *Musée Botanique de Benjamin Delessert,* published in 1845.

He further informs us that they have complete lists of the Candollean plants between 1794 and 1821, but that MASSON's name does not appear in them. So there is no doubt that the DELESSERT Herbarium does not include any MASSON specimens. However, there is a possibility that some of his plants have found their way into the BARBEY-BOISSIER Herbarium, but they have no records of it.

Our readers will be interested to learn that the plant of *Encephalartos longifolius*, Lehm. ("E. caffer") which MASSON brought to Kew from the Cape in 1775 (see Part IV of MASSON, this Journal, Jan., 1960, p. 13) still survives. Having read our reference to this introduction of MASSON's, Dr. C. E. HUBBARD, Deputy Director of the Royal Botanic Gardens, writes that this reminded him that in 1959 on the occasion of the Bicentenary of Kew Gardens, when he delved into the history of Kew and particularly into J. SMITH's "Records" (1888), he noted his remarks about the above plant being one foot high in 1822, and 3 feet in 1848. About 60 years later, W. J. BEAN in his book *The Royal Botanic Gardens, Kew* (1908), pp. 133–4, writes, as quoted by Dr. HUBBARD, that "even now its stem is but eight feet high". They still have what is assumed to be the same plant growing in a large tub in the Palm House, now with the stem inclined and about 11 feet long.

CORRIGENDA.

Part III, MASSON'S JOURNEYS, this Journal, Vol. XXV, July, 1959, p. 184, footnote 74. LINNAEUS *filius* has been erroneously stated as the authority of *Aloe dichotoma*, the Kokerboom. This should be MASSON. See REYNOLDS, *Aloes of South Africa* (1950), p. 488.

Part IV, MASSON'S PLANTS, this Journal, Vol. XXVI, Jan., 1960, p. 12. We have been wrongly informed about the whereabouts of the DELESSERT Herbarium. It is not at Zürich, as stated, but it is housed at the Conservatoire et Jardin Botaniques at Geneva.

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NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

By H. M. L. Bolus.

Stayneria, gen. nov.—Erecta robustissima, diffuse laxeque ramosa, glabra, ad 60 cm. alta, 90 cm. diam.; radix saepius horizontalis lignosa, 3 cm. diam.; caulis basi ad 3 cm. diam.*; rami primarii 38—52 cm. longi basi ad 1·2 cm. diam., internodiis saepius 3—4 cm. longis, superioribus 4—6 mm. diam., nodis reliquias induratas anni prioris ferentibus, ramulis ultimis 3—15 cm. longis; folia ascendentia, interdum subfalcata, basi per 4—5 mm. decurrentia quasi vaginata, "vagina" impresse lineata, supra plana lineari-lanceolata, superne acuta, acute carinata, lateribus leviter convexis, lat. visa superne vix angustata, apice subacuta vel oblique rotundata, levia viridia, 5·5—7 cm. longa, medio 5—7 mm. lata, ad 8 mm. diam.; flores 3-nati, per diem noctemque expansi, ad 4 cm. diam.; cymae pedunculus ad 1 cm., fructiferus ad 2·5 cm., longus, bracteis ad 2 cm. longis, pedunculis ultimis ad 5 mm. longis, basi bracteatis vel intermedio ebracteato, bracteis ad 8 mm. longis; receptaculum subglobose obconicum, 6—7 mm. longum, apice 8—10 mm. diam.; sepala 5—6, superne carinata compressaque, acuta, omnia ± marginata, 7—10 mm. longa, basi 3—6 mm. lata; petala 1—2-seriata, saepius inferne angustata, apice rotundata, rarius emarginata, nivea, ad 1·5 cm. longa, 1·5—2·5 mm. lata; staminodia numerosa acuminata alba, cum aetate rubre brunnea, ad stamina conice conferta appressa eaque bene excedentia, inferne obscure ciliate papillata, ad 9 mm. longa; filamenta ca. 5-seriata, alba, ad 7 mm. longa, intima prope medium papillata, antheris pollineque albidis; nectarium anulare inconspicuum; ovarium medio leviter elevatum, lobis inconspicuis; stigmata 6—9, saepius 7—8, anguste subulata, inconspicue papillata, ad 5 mm. longa; capsula rigidissima, quasi lignosa, interdum viscida, ad 1·4 cm. longa, apice ad 1·2 cm., expansa ad 1·7 cm., diam., infra globose obconica, obscure costata, supra ad 2 mm. elevata, suturis leviter compressis, valvis expansis late patentibus, carinis inferne parallelis, superne divergentibus, aristatis integris, parum ultra medium valvae attingentibus, alis lateralibus nullis, "ala" mediana bene evoluta, valvis expandentibus non iterum omnino claudentibus; semina obovata brunnea, 1 mm. longa.

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* These measurements were exceeded by other still more robust plants seen by the discoverers.

Species 1, **S. littlewoodii.**

Cape Province: in dit. Worcester; "Nuy on a high koppie composed of sandstone immediately S.W. of the Rabiesberg, 8 miles E. of Worcester". Jun. 1960, *W. F. Stayner* et *R. C. Littlewood* (Karoo Garden 438/60).

This genus is most nearly allied to **Ruschia,** from which it differs in having 7—9, or very rarely 6, stigmas, and capsules which repeatedly expand fully, but do not close again completely afterwards, the lower half of each valve being erect and the upper bent inwards more or less horizontally, leaving a gap between the valves.

Mr. Littlewood tested 24 capsules "by soaking them until they were expanded, and after being dried in the open air they all failed to close properly. I would say that they were about three-quarters closed".

? **Namaquanthus farinosus** L. Bol. (Mesemb. III, 334).—The type of this species (N.B.G. 583/43), collected by Major C. H. F. Wooley at Port Nolloth in 1943, flowered at Kirstenbosch in June 1956 and March 1957, and in the absence of fruit was tentatively placed in the genus **Namaquanthus.** In August 1960 it bore fruit for the first time, and of the three capsules produced one had 11 carpels and the others 12. These differ from the only capsule known of **Namaquanthus** in having the expanded valves widely spreading (not almost erect) and much less rigid, the keels parallel almost to the apex (not widely diverging from near the base), the tubercle absent and the seeds quite smooth (not echinate). The flowers, which are smaller and much less handsome, differ chiefly in having staminodes and pallid papillate filaments, those of **Namaquanthus** being purple and epapillate. The "mealy" surface of the vegetative parts, which suggested the specific name, has not been seen by us in any other species of the *Mesembrieae.* Being excluded by these differences from **Namaquanthus,** its nearest ally, the new genus, **Wooleya,** is proposed, commemorating Major C. H. F. Wooley, who for many years has contributed succulents to Kirstenbosch from various parts of South Africa.

Wooleya, gen. nov.—Capsula 11—12-locularis, 1 cm. longa, infra obconica, supra gradatim versus medium ad 2 mm. elevata, suturis compressis, marginibus ringentibus, 1 cm., expansa 1·8 cm., diam., valvis late patentibus, alis superne carinis coalitis, ca. 1—1·5 mm. latis, ad apicem verum saepe attingentibus, carinis parallelis, prope apicem tantum leviter divergentibus, alis tegentibus bene evolutis, tuberculo nullo.

Species 1, **W. farinosa.**

Three earlier collections of this species from Namaqualand are represented in the Bolus Herbarium, hitherto unidentified, made in October

1924 by *N. S. Pillans* (N.B.G. 1717/24) at Hondeklip Bay; in August 1929 by *L. Bolus* (Bolus Herb. 26978), without precise locality, in fruit and flowering in March 1930, when a coloured drawing was made by B. O. Carter; and in April 1930 by *Mrs. E. A. Good* (Bolus Herb. 26979) at Kleinzee, in flower.

The type-plant is still healthily alive after a sojourn of 17 years at Kirstenbosch.

Delosperma hallii.—**D. pergamentaceo** valde affine sed foliis latioribus, minute granulatis itaque tactu asperulis, lat. visis quasi inter digitum pollicemque compressis, carina sat obtusa, floribus minoribus, petalis pulchre roseis, basi tantum albis, praecipue differt.

Dense compactum, 10—15 cm. altum diametroque; rami 2-angulati politi, internodiis inferioribus inclusis; folia fere erecta vel demum fere patentia, senecta per annos plures persistentia, supra marginibus similibus vel parum supra medium latere altero leviter ampliato, acuta vel subobtusa, lat. visa medio vel parum supra latissima, altero paris parum latiore, e basi superne gradatim ampliata, obtusa vel abrupte acuta, ad 4·6 cm. longa cum vagina 3 mm., ad 1·5 cm. lata diametroque; flores solitarii vel, ut videtur, inflorescentiam 4·5 cm. longam, ramum terminentem, formantes, flore unico per annum producto, reliquiis persistentibus induratis 3—4 annorum visis; pedunculus 6—8 mm. longus, basi bracteatus, bracteis ad 2 cm. longis, ad 1 cm. diam.; receptaculum obconicum, 4—5 mm. longum, 6—8 mm. diam.; sepala 5, superne valde compressa, acute carinata, interiora sat anguste marginata, 5—6 mm. vel 5—7 mm. longa, basi 3—5 mm. lata; petala 3—4-seriata, inferne non vel leviter angustata, obtusa, 1—1·8 cm. longa, ad 1·5 mm. lata; staminodia nulla; filamenta 4-seriata, mox erecta, epapillata, ad 4 mm. longa; glandulae nectarii distantes; ovarii lobi valde compressi, ad 2 mm. elevati; stigmata gracilia, ad 6 mm. longa; capsula 5 mm. longa, 7 mm. diam.

South West Africa: "approx. 6 miles north of the Orange River, near the abandoned Kahan Copper Mine," Mart. 1960, *H. Hall* 1923. N.B.G. 229/60. Fl. Sept.—Oct. 1960.

I am indebted to Mr. Hall for the following valuable field-notes connected with his interesting discovery of a second species whose vegetative characters, as in the closely related **D. pergamentaceum,** are so very different from those of any other species in this large and polymorphic genus: "A compact, fleshy-leaved shrub 4″—6″ high and wide. Leaves silvery grey-green, old leaves persistent and fleshy for many years. All leaves noticeably rough to the touch. Owing to severe drought few plants were flowering, but all those seen bore rose-pink petals. Only one colony seen, consisting of several hundred plants, from seedlings to adult bushes, concentrated in an area approximately 50 yards square, on a fairly steep rocky slope of broken granite and mica shales, associated with, amongst others, **Ceraria fruticulosa, Ceraria namaquensis, Monsonia multifda, Crassula sladeniana, Crassula fusca, Aloe ramosissima** and **Euphorbia** spp."

Mr. Hall is familiar with the older species, **D. pergamentaceum,** in its native haunts and describes it as being "widespread on both banks of the lower Orange River, usually in white quartz-strewn ground where the vegetation is very sparse". He was, therefore, well able to see that **D. hallii** could be distinguished "by its densely branched and compact habit, shorter leaves, less compressed laterally, silvery grey-green *rough* (like fine sandpaper) epidermis, and rose-pink flowers 1″ in diameter from **D. pergamentaceum** with its more loosely branched habit, very smooth parchment-like yellowish green epidermis and white flowers 1½″ in diameter".

Ebracteola candida.—Tuber 4·5 cm. longum, apice 4 cm. diam.; partes herbaceae subvelutinae ob papillas minutissimas, glauce virides; rami dense conferti, saepius 4-foliati; ramuli floriferi 2—4-foliati, internodiis inclusis; folia matura fere erecta vel demum patentia, supra linearia acuminata, ex infra medium valde lateraliter compressa acuteque carinata, lateribus planis vel leviter convexis, lat. visa superne ampliata, apice oblique rotundata vel subtruncata vel alterum paris acutum, minute tuberculata, matura 3—4·5 cm. longa cum vagina 4 mm., medio 3—5 mm. lata, ad 7—9 mm. diam. vel alterum paris leviter minus; flores rite 3-nati, laterales tardius evoluti, diurni; pedunculi ad 1 cm. longi, in receptaculum gradatim abeuntes, laterales basi bracteati, bracteis 5—15 mm. longi; receptaculum clavatum, 6 mm. longum, 7 mm. diam.; sepala 5, acuminata, conspicue apiculata, 6—10 mm. longa, basi 3—4 mm. lata; petala ca. 3-seriata, inferne leviter angustata, saepius obtusa, candida, 1·5—2 cm. longa, 1—1·5 mm. lata; staminodia candida, inferne minute ciliate papillata subintertextaque, stamina conferta excedentia, matura mox superne revoluta; filamenta 5-seriata candida, ad 6 mm. longa, interiora medio vel parum ultra papillata, antheris pollineque luteis; discus crenulatus; ovarii lobi erecti, obtuse compressi, fere ad 1 mm. elevati; stigmata 5, e basi subulata longe attenuata, caudata, ad 5 mm. longa.

South West Africa: "about 60 miles north of Aus," Mart. 1960, *H. Hall* 2006. N.B.G. 308/60. Fl. Sept.—Oct. 1960.

This may be the same as "Ebracteola vallis-pacis Dint."—a nomen nudum.

Ruschia paucipetala.—Ramus 1 visus, glaber, 19 cm. longus, basi 3 mm. diam., internodiis 5—10 mm. longis, dense ramosus ramulosusque; ramulis ultimis hornotinis sterilibus saepius 4-foliatis, pari inferiore saepius patente, superiore erecto vel ascendente, internodio incluso, floriferis 2-foliatis; folia supra plana obtusa vel subobtusa, carina ad lineam reducta, lateribus convexis, lat. visa superne non angustata, apice fere rotundata, minute tuberculata, viridia, saepe partim vel omnino rubescentia, 5—10 mm. longa, vagina 2 mm. longa, medio ad 4 mm. lata, ad 5 mm. diam.; flores 1—3-nati diurni, 10—12 mm. diam.; pedunculi teretes, 2—3 mm., vel persistentes subspinescentes (2 visi) 5 mm. longi, basi bracteati, bracteis foliis simillimis, saepius 3—5 mm. longis; receptaculum subclavatum, prope apicem leviter constrictum, 3—4 mm. longum diametroque; sepala 5, subobtusa, 2—3 mm. vel 3—4 mm. longa, basi 1·5—2 mm. lata, interiora sat anguste marginata; petala pauca, 1—2-seriata, inferne non angustata, obtusa, purpureorosea, 3—4·5 mm. longa, vix ad 1 mm. lata; staminodia nulla; stamina 2—3-seriata, sat pauca, prope basim constricta, deinde erecta, filamentis basi pallide roseis, deinde roseopurpureis, exterioribus prope basim ciliate papillatis, intimis basi papillatis; discus profunde divisus; ovarium supra tuberculatum, lobis subglobosis distantibus, ad 1 mm. elevatis; stigmata 5—6, anguste subulata, inferne conspicue papillata, superne attenuata, apice caudata, ad 2·5 mm. longa.

Cape Province: Namaqualand: "14 miles north of Steinkopf, Oct. 1959, *R. C. Littlewood.* Karoo Garden 659/59. Fl. Sept. 1960.

The following measurements were taken from an entire plant by Mr. Littlewood:—"Height 24 cm., diameter 28 cm.; stem at base 1·8 cm. diam.; primary branches 12—14 cm. long, 5 mm. diam., secondary branches 12 cm. long, 2 mm. diam."

Ruschia littlewoodii (*Microphylla*).—Planta caespitosa glabra, 3 cm. alta, ad 6 cm. diam.; radix tuberosa, 9 cm. longa, inferne attenuata, superne ad 1 cm. diam.; partes herbaceae minute tuberculatae; rami primarii ad 2·5 mm. diam.; ramuli ultimi dense ad 6-foliati, internodiis invisis, axillis conspicue gemmiferis; paria foliorum similia vel interdum difformia, inferiora breviora, latiora diametroque majore; folia supra lanceolata, adulta superne obtuse carinata, lateribus leviter convexis, lat. visa superne angustata, acuta vel obtusa, apiculo in novellis vix ad 1 mm. longo, in adultis inconspicuo, 1—1·8 cm. longa, vagina 2—4 mm., medio 2—3 mm. lata, 2—4 mm. diam.; pedunculus teres, 3—7 mm.

longa, basi bracteatus, bracteis ad 1·2 cm. longis, vagina subventricosa, 3 mm. longa; receptaculum obconicum, interdum prope apicem leviter constrictum, 3—4 mm. longum, apice 4—5 mm. diam.; sepala 5, acuta, omnia ± anguste marginata, apiculata, 4—5 mm., vel in alabastris maturis 5—7 mm., longa, basi 2—4 mm. lata; petala 1—2-seriata, inferne vix angustata, saepius obtusa, purpureorosea, dimidio inferiore vittato, 5—6 mm. longa, vix ad 1 mm. lata; staminodia nulla; filamenta 4-seriata, conice conferta, inferne pallida, superne roseopurpurea, extima inferne ciliate papillata, intima prope medium papillata, antheris pollineque albis vel albidis; nectarium sat conspicuum, profunde divisum; ovarium supra interdum altitudinem disci vix excedens, lobis obtuse compressis; stigmata 5, gracilia, superne angustata, viridia, demum ad 5 mm. longa.

Cape Prov.: in dit. Ceres, "38 miles north of Ceres on the Citrusdal Road at the base of a koppie," Oct. 1959, *R. C. Littlewood.* Karoo Garden 603/59. Fl. Aug. 1960.—Mr. Littlewood notes that this locality "appears to be in the transition stage between Protea Veld and Karoo. The only other succulent I found there was a Lampranthus".

Ruschia argentea (§ *Microphylla*).—Planta 1 visa, dense compacta, floribus exclusis ad 3·3 cm. alta, 7·5 cm. diam., caule apice 5 mm. diam.; rami primarii patentes, inferne reliquiis induratis annorum priorum (ad 10 annos) vestiti, ad 5 mm. diam.; partes herbaceae dense minutissimeque capillaceo papillatae itaque tactu subvelutinae; ramuli steriles et ramuli floriferi 2-foliati; folia ascendentia, supra cum vagina oblonge ovata, acuta vel subobtusa, carinata, lateribus planis, lat. visa apice tantum angustata vel subrotundata, apiculo brevi induratoque, marginibus carinaque papillate ciliolatis, pallide glauce viridia vel argentea, 1·1—1·3 cm. longa cum vagina 4 mm., medio saepius 4 mm. lata diametroque; pedunculi in receptaculum gradatim abeuntes, 1·5 cm., persistentes indurati 1—1·5 cm., longi, basi bracteati, bracteis subfalcatis, inferne membranaceo marginatis, 7 mm. longis, vagina subventricosa, ad 1·5 mm. longa, supra medium ad 1·5 mm. diam.; receptaculum obconicum, 3 mm. longum, ad 4 mm. diam.; sepala 5, omnia ± marginata, acuta, 3—4 mm. vel 4—5 mm. longa, basi 1·5—2 mm. lata; petala 2-seriata, inferne non vel leviter angustata, obtusa vel rarius acuta, rosea, angustissime saturatioreque vittata, 4—6 mm. longa, 0·5—1 mm. lata; staminodia sat pauca, pallide rosea, stamina conice collecta saepius aequantia; filamenta 2—3-seriata, pallida vel alba, ad 3 mm. longa, exteriora basi ciliate papillata, interiora prope apicem vel prope medium papillata, antheris pollineque pallidissime stramineis; discus profunde crenulatus; ovarii lobi substellatim patentes, compressi sulcati, ad 0·75 mm. elevati; stigmata 5, subulata, breviter caudata, 1·5 mm. longa.

South West Africa: Witputs, Mart. 1960, *H. Hall* 1883. N.B.G. 189/60. Fl. Jun. 1960.

Ruschia stenopetala.—Erecta compacta glabra, 9 cm. alta, 10 cm. diam.; rami primarii 6—8 cm. longi, ad 4 mm. diam., ramuli 3—5 cm. longi, floriferi 2-foliati; folia ascendentia, interdum fere erecta, supra plana linearia, superne leviter angustata, obtusa, obtuse carinata, lateribus subconvexis, lat. visa superne non vel leviter angustata, sordide saturateque viridia, 1·5—2 cm. longa cum vagina 2—3 mm.; flores solitarii diurni, ad 1·4 cm. diam.; pedunculus in receptaculum clavatum, 2 mm. longum, 3—4 mm. diam., gradatim abeuns, 5—8 mm., fructiferus ad 1·9 cm., longus, basi bracteatus, bracteis arte amplectentibus, lat. visis acutis, acute carinatis, membranceo marginatis, saepius basim receptaculi attingentibus; sepala 5, acuta, 3—4 mm. longa, basi 1·5—2 mm. lata; petala 2-seriata, in fascicula 5 disposita, inferne non vel vix angustata, obtusa rosea, inferne pallida, saepius ad 4 mm. longa, ad 0·5 mm. lata, inter angustissimas in genere visas itaque nomen (*stenos*, narrow); staminodia numerosa, stamina aequantia vel excedentia, inferne pallida, superne purpurascentia, exteriora mox late recurvata; filamenta 3-seriata, superne purpurascentia, ad 2·5 mm. longa, extima basi ciliate papillata, intima medio vel supra papillata, antheris pollineque albis; discus crenulatus, sat conspicuus; ovarii lobi obtuse compressi, ad 0·5 mm. elevati; stigmata 5, anguste subulata, ad 2 mm. longa; capsula ad 4 mm. longa, 6 mm., expansa 9 mm., diam., infra breviter globoseque obconica, angulis inter valvas superne rotundatis, supra per 1·5 mm. elevata, suturis leviter compressis, carinis valvae e basi divergentibus, aristatis, ultra medium valvae attingentibus, "ala mediana" sat bene evoluta, alis tegentibus valde compressis, tuberculo obtuse conspicueque carinato, pallido magno, os complente, aliter generis.

Cape Province: in dit. Vanrhynsdorp; "10 miles N. of Vanrhynsdorp". Maio 1960, *R. C. Littlewood* (Karoo Garden 276/60). Fl. Jun.—Jul. 1960.

Ruschia kuboosana.—Glabra; partes herbaceae virides; rami plures visi, laxi (ob cultum ?), 7—14 cm. longi, internodiis 1·5—3·5 vel rarius ad 4 cm. longis, ad 3 mm. diam.; folia ascendentia, supra plana linearia, prope apicem leviter angustata, acuta vel subobtusa, lateribus convexis, carina obscuro, lat. visa saepius non angustata, apice subrotundata vel juniora subacuta, levia vel sicca asperula ob punctas minutas elevatas, 3—4·5 cm. longa cum vagina ad 4 mm., 5—7 mm. lata diametroque; flores solitarii diurni, ad 2 cm. vel rarius ad 2·5 cm. diam.; pedunculus in receptaculum subclavatum, 2—3 mm. longum, 5—7 mm. diam., gradatim abeuns, lateraliter compressus, 1—1·7 cm. longus, bracteis prope medium positis, fere erectis, interdum subfalcatis, 10—12 mm. longis cum vagina ad 2 mm. longa, 2—4 mm. diam.; sepala 5, dimidio superiore acuminata, carinata, interiora sat anguste marginata, 5—8 mm. vel 6—9 mm. longa, basi 3—6 mm. lata; petala 1—2-seriata, inferne leviter angustata, apice rotundata, purpureorosea, 6—8 mm. vel rarius ad 10 mm. longa, ad 1·25 mm. lata; staminodia pallide rosea, stamina conice conferta subaequantia; filamenta ca. 3-seriata, exteriora inferne ciliate papillata, intima prope medium papillata, inferne pallida, prope apicem rosea, vix ad 5 mm. longa, antheris pollineque dilute luteis; discus inconspicuus; ovarii lobi obtuse compressi, ad 1 mn. elevati; capsula non visa.

Cape Province: Namaqualand; Richtersveld, Kuboos, Sept. 1954, *H. Herre* (S.U.G. 13250). Fl. Maio 1960.

Ruschia modesta L. Bol. forma **glabrescens.**—Partes novellae ut in forma typica velutinae, sed folia matura culta saturate viridia glabrescentia, papillis capillaribus brevissimis, in siccis tantum facile visis.

South West Africa: Sperrgebiet, Jun. 1956, *A. L. Geyer* (S.U.G. 13973). Fl. Maio 1960.

Ruschia compressa.—Rami 2 visi, cum floribus 7—8 cm. longi, basi ca. 4 mm. diam., internodiis 4—20 mm. longis; ramuli floriferi 2-foliati; partes herbaceae minute papillate pubescentes; folia ascendentia, supra plana, linearia acuta, basi ad 7 mm. lata, carinata, lateribus leviter convexis, lat. visa acuta vel subacuta, culta ad 3 cm. longa cum vagina 3—4 mm., 6—8 mm. diam.; flores solitarii diurni, ad 2·1 cm. diam.; pedunculi superne dilatati, in receptaculum clavatum, ad 3 mm. longum, ad 5 mm. diam., gradatim abeuntes, feri fructiferi ad 2·7 cm., culti ad 3·2 cm., longi; sepala 5, acuta vel acuminata, 4—5 mm. vel 5—6·5 mm. longa, basi 2—4 mm. lata, omnia ± marginata; petala 3-seriata, in fascicula 5 disposita, inferne non angustata, obtusa vel acuta, rosea, 5—7 mm. longa, 0·5—0·75 mm. lata; staminodia ad stamina conice conferta, medio constricta, ad 4 mm. longa, adpressa eaque aequantia, inferne ciliate papillata roseaque, superne rubescentia; filamenta interiora prope medium papillata, antheris pollineque albidis; discus crenulatus; ovarii lobi erecti, obtuse compressi, ad 1 mm. elevati; stigmata 5, anguste subulata, longe attenuata, breviter caudata; capsula anni prioris visa, ad 5 mm. longa, 6 mm., expansa 1·1 cm., diam., infra breviter obconica, costate 10-nervata, 5 alternantibus costis minus conspicuis, supra per 2 mm. elevata, suturis valde compressis, valvis sat brevibus, carinis e prope basim divergentibus, dimidium valvae attingentibus, fere erectis, minute laceratis, apice truncatis, arista brevissima, tectis loculorum profunde compressis, marginibus erectis, tuberculo pallido, os fere complente, seminibus levibus.

Cape Province: Namaqualand; Richtersveld, Kuboos, Jul. 1948, *H. Hall* (N.B.G. 1056/48). Fl. Jun. 1949.

Nananthus margaritiferus.—Planta ca. 6 cm. diam.; tuber 6·5 cm. longum, ad 1·6 cm. diam. folia patentia supra fere plana, apiculo nullo, dense conspicueque punctata, punctis margaritas simulantibus, ad 3 cm. longa, ad 8 mm. lata, ad 7 mm. diam.; flos 1 visus; pedunculus brevissimus; bracteae 7 mm. et 9 mm. longae; receptaculum late obconicum, 3 mm. longum, ad 6 mm. diam.; sepala 5, superne gradatim angustata, exteriora obtusa, interiora acuta vel subobtusa, 5—6 mm. longa, basi 3—4 mm. lata; petala 2—3-seriata, breviora perpauca, inferne non angustata, apice rotundata, lutea, externe prope apicem rosea, non rubre vittata sed tamen medio lineata, linea saturatiore lutea, inconspicuo, externe inviso, 4—8 mm. longa, ad 1 mm. lata vel rarius parum ultra; stamina prope medium constricta, ca. 3-seriata subaequilonga, filamentis albis, exterioribus inferne inconspicue ciliate papillatis, intimis infra medium dense papillatis, antheris pollineque albidis; discus conspicuus crenulatus; ovarium supra fere planum, in medio vero tantum altitudinem disci attingens; stigmata 10, gracillima subalba, 5 mm. longa.

? Bechuanaland; Kalahari, "30 miles east of Nossob River at Anemus, *H. Giess* (N.B.G. 446/59). Fl. Maio 1960.

Closely allied to **N. aloides** from the typical form of which it chiefly differs in having the stigmas longer than the stamens, from the varietal form in its much narrower leaves, smaller flowers with much narrower petals, and from both by the conspicuously pearl-punctate leaves which suggested the name (margarita, a pearl).

Cheiridopsis vanheerdei.—**C. turbinatae** affinis, sed pari secundo foliorum primo aequilongo, floribus majoribus, receptaculo angulato, ovarium supra gradatim medium versus elevatum (non convexum), stigmatibus 13, capsula infra late breviterque conica (non semiglobosa ut in **C. turbinata**) praecipue differt.

Partes herbaceae glabrae, glauce virides vel glaucae; rami steriles 6-foliati, floriferi 4-foliati; folia inferiora in ramo florifero supra lineare lanceolata acuta, basi pustulata, inferne dorso rotundata, superne carinata, lateribus superne planis, lat. visa superne non vel apicem versus leviter angustata, alterum subacutum, alterum subtruncatum vel subrotundatum, 8·5 cm. longa cum vagina 2 cm., medio 1 cm. lata diametroque vel unicum visum ad 1·5 cm. diam.; folia superiora inferioribus simillima, 7 mm. lata diametroque; flores 8—11 cm. diam. (maximi speciosissimique in genere visi); pedunculus 6 cm. longus, ad 5 mm. diam.; bracteae supra visae acuminatae, 1·6—2·5 cm. longae; receptaculum obconicum, 5-angulatum, 6 mm. longum, 1·6 mm. diam.; sepala 5, superne compressa, acuta, lat. visa subtruncata, 3—4 mm. diam., 1·1—1·6 cm. longi, basi 7—12 mm. lata, interiora late marginata; petala ca. 6-seriata, infra medium leviter angustata, acuta vel obtusa, inferne lutea superne salmonea (ripe apricot-tint), 0·7—5 cm. longa, 0·25—2 mm., saepius 1·5 mm., lata; filamenta ad 6-seriata, pallida, ad 8 mm. longa; antheris pollineque pallide luteis; ovarium supra circa marginem concavum, deinde gradatim lobatum adque 1·5 mm. elevatum, lobis contiguis obtusis; stigmata 13, anguste subulata, ad 5 mm. longa; capsula 1·2 cm. longa, infra late obconica, supra medio 5 mm. longa, 2 cm. diam., suturis leviter compressis, marginibus ringentibus.

Cape Province: Namaqualand; Aug. 1934, *P. Vanheerde* (Bolus Herb. 26977). Fruct. Jan. 1935.

Sphalmanthus littlewoodii.—Radix lignosa; caulis 6 mm. diam.; partes herbaceae virides, minute inconspicueque nitente papillosae; rami primarii decumbentes vel prostrati, teretes ad 37 cm. longi, internodiis 2·5—4·5 cm. longis, 3—5 mm. diam.; ramuli ascendentes vel fere erecti 7—15 cm. longi; folia ascendentia vel fere patentia, supra plana vel leviter canaliculata, obtusa, dorso rotundata, lat. visa superne vix angustata, apice saepe rotundata, 2—3·5 cm. longa, 4—6 mm. lata diametroque, vagina subnulla; flores 3-nati vel biternati vel cum aetate irregulariter triternati, per diem noctemque expansi, corolla demum ad 2·5 cm. diam.; pedunculi 1—3·5 cm. longi; receptaculum globose obconicum, 6—7 mm. longum, apice 7—8 mm. diam.; calycis tubus 1·5—2 mm. longus, segmentis 5 vel rarius 4, foliis similibus, exterioribus ad 2·7 cm., saepius ad 1·5—2 cm., longis, 4—7 mm. diam., 2 intimis multo minoribus, late marginatis, 5—6 mm. longis, basi 2—6 mm. latis; corolla 1—1·5 cm. longa, tubo vix ad 2 mm., segmentis 2—3-seriatis, obtusis vel subtruncatis, pallidissime roseis; staminodia fere alba; stamina 7—8-seriata, ad 9 mm. longa, filamentis pallidis, antheris pollineque aureis; fossae nectariferae sat profundae; ovarium supra vix ad 2 mm. elevatum, lobis superne compressis; stigmata 5, anguste subulata, longe attenuata, ad 4 mm. longa; capsulae anni prioris 3 visae, duae 5-loculares, unica 4-locularis, ad 1·3 cm. longae, infra obconicae, 8 mm. longae, ad 7 mm., expansae 1·7 cm., diam.

Cape Prov.: in dit. Worcester, prope Matjesfontein, Sept. 1959, *R. C. Littlewood.* Karoo Garden 449/59. Fl. Aug.—Sept. 1960.

Cephalophyllum laetulum.—Partes herbaceae saturatius virides; rami plures visi, decumbentes subflexuosi, leviter alati, politi, pallide brunnei, ad 35 cm. longi, 4 mm. diam., internodiis 2—5 cm. longis; ramuli floriferi saepius 2—6 cm. longi, internodiis 5—20 mm. longis; folia supra leviter convexa, linearia, superne leviter angustata, subacuta, carina inferne vix visa, prope apicem obtuse carinata, itaque dorso fere rotundata, lat. visa prope apicem leviter angustata, obtusa vel rarius superne ampliata apiceque rotundata, 3—6 cm. longa cum vagina 3 mm., medio 3—4 mm. lata, 4—6 mm. diam.; flores laxe 3-nati vel biternati vel demum ultra, in genere inter minima, 2·5—3·5 cm. diam.; pedunculi 4—6 cm. longi, basi bracteati, bracteis 15—7 mm. longis cum vagina 4 mm.; receptaculum semiglobosum, 3 mm. longum, 6 mm. diam.; sepala 5, exteriora obtusa, interiora subacuta ampleque marginata, 5—6 mm. longa, basi 3—4 mm. lata; petala 2-seriata, inferne leviter angustata obtusa, laete lutea, 1·3—1·8 cm. longa, 1·5—2 mm. lata; filamenta 4-seriata aurea, ad 5 mm. longa, antheris pollineque luteis; discus crenulatus; ovarii lobi superne valde compressi, ad 1·5 mm. elevati; stigmata 10, angustissime subulata, conspicue papillata, pallide viridia, 4 mm. longa.

Cape Province: Namaqualand; Richtersveld, Grootderm, Sept. 1954, *H. Herre* (S.U.G. 13244). Fl. Jun. 1960.

The flowers are among the smallest in the genus. Their cheerful yellow and size suggested the name—cheerful little one.

Cephalophyllum hallii.—Dense compactum, 13 cm. altum, 11 cm. diam.; rami inferne reliquiis induratis vestiti; ramuli hornotini 4-foliati, internodio incluso; folia matura ascendentia vel alterum paris fere erectum, alterum subfalcatum, supra visa anguste lanceolata, saepe subfalcata, superne carinata, lateribus leviter convexis, lat. visa superne leviter angustata, obtusa, saturate olivaceo viridia, 3—4 cm. longa cum vagina 4 mm. longa, medio 6—7 mm. lata diametroque, novellorum marginibus apiceque minute cartilagineo serrulatis; flos unicus visus; pedunculus teres, a receptaculo distinctus, 1·6 cm. longus, basi bracteatus, bracteis 1·7 cm. longis cum vagina 5 mm.; receptaculum crateriforme, 2 mm. longum, 5 mm. diam.; sepala 5, prope apicem carinata acuta, 4—5 mm. longa, basi 3—5 mm. lata, interiora ample brunneo marginata; petala 3-seriata, inferne cuneate angustata, obtusa vel saepe emarginata, purpureorosea, 6—12 mm. longa, 0·5—1·5 mm. lata; stamina 3—4-seriata, conferta, fere erecta, filamentis epapillatis, pallidissime roseis, antheris purpureobrunneis, saepe 0·5 mm. longis, polline pallidissime roseo; discus inconspicuus, minute crenulatus; ovarium supra convexum, minute tuberculatum, lobis inconspicuis, prope apicem subcompressis, ad 0·75 mm. elevatis; stigmata 9—10, anguste subulata, pallida, 1·75 mm. longa; capsula basi apiceque plana, supra ad 2 mm. elevata, ad 1·2 cm., expansa 2·1 cm., diam., suturis leviter, vel vix compressis, tuberculo rotundato albo, ad 1·25 mm. diam.

Cape Prov.: Calvinia Div.; nr. Loeriesfontein, on the farm Vosfontein, Aug. 1960, *H. Hall* 2053. (N.B.G. 748/60.)

Lampranthus neostayneri (*Scabrida*).—Erecta glabra, 15—30 cm. alta, ad 30 cm. diam.; caule basi 5—9 mm. diam.; rami inferne patentes, deinde ascendentes vel erecti, internodiis rubre brunneis, saepius 1—1·5 cm. longis; folia ascendentia, patentia vel recurva, supra anguste linearia, acuta vel acuminata, lat. visa prope apicem leviter angustata, acuta, axillis conspicue gemmiferis, scaberula viridia, matura 1—1·5 cm., rarius ad 2 cm., longa, saepius medio 1—1·5 mm. lata diametroque; flores 1—3-nati vel irregulariter 2-ternati, 2·5—4 cm., maximus visus 4·5 cm., diam.; pedunculi teretes, 1·2—3 cm. longi, infra medium bracteati; receptaculum obconicum, minute furfuraceum, 3—4 mm. longum, 5—6 mm., vel interdum ampliata ad 8 mm., diam.; sepala 5, membranis amplis atratis exclusis, fere aequilonga, acuminata vel acuta, 5—6 mm. longa, basi 3—4 mm. lata; petala 2—3-seriata, parte infima tertia conspicue angustata, obtusa vel rarius acuta, purpureorosea, 8—18 mm. longa, 1·5—2 mm. lata; staminodia pauca, stamina conice conferta aequantia vel breviora; filamenta rosea, ad 4 mm. longa, exteriora obscure ciliate papillata, interiora medio vel parum infra papillata; discus crenulatus; ovarii lobi dorso complanati, ad 1—1·5 mm. elevati; stigmata 5, subulata, 3—4 mm. longa cum cauda 0·75 mm.; capsula ad 1 cm· longa, 1 cm., expansa 1·5 cm., diam., infra obconica obtuse 5-angulata, 7 mm. longa, suturis leviter compressis.

Cape Province: in dit. Piketberg, "1 mile S.W. of Porterville" Aug. 1960, *F. J. Stayner*. Karoo Garden 568/60; inter Porterville et Twenty-four Rivers, Aug. 1945, *L. Bolus* (Bolus Herb. 26980) typus; in dit. Stellenbosch, prope oppidum, Sept. 1931, *L. Bolus* (Bolus Herb. 19950).

Lampranthus brachyandrus (L. Bol.) N.E. Br. forma—Erectus glaber rigidus, copiose ramosus; rami primarii plures visi, ad 26 cm. longi, ad 6 mm. diam.; ramuli 5—12 cm. longi, ad 3 mm. diam., internodiis 2—15 mm. longis, cuticula alba vel cinerea vel novella brunnea; folia ascendentia vel patentia, supra visa linearia-oblonga, obtusa vel acuta, dorso rotundata vel obscure carinata, lateribus convexis, lat. visa superne leviter ampliata, obtusa levia glauca, apicem versus purpurea, 1·5—2 cm. longa cum vagina 1 mm., saepius ad 5 mm. lata, 5—6 mm. diam.; flores 3-nati vel 2-ternati, rarius solitarii; pedunculi 7—8 mm., fructiferi ad 11 mm., longi, laterales parum infra medium bracteati, bracteis foliis simillimis, 5—7 mm. longis; receptaculum obconicum, 3—4 mm. longum, 5—6 mm. diam.; sepala 5, supra basim leviter constricta, obtusa, superne incrassata, exteriora breviora interioribus brunneo marginatis, 4—5 mm. longa, basi 2—3 mm. lata; petala ca. 6-seriata, interiora pauca acuta, exteriora 2—3-seriata, e parum supra medium angustata, obtusa vel emarginata, purpureorosea, 4—16 mm. longa, ad 1·5 mm. lata; staminodia nulla; filamenta diu erecta, 3-seriata, ad 2·5 mm. longa, exteriora basi, interiora parum supra basim, papillata, pallida, antheris pollineque luteis; discus leviter complanatus, obscure crenulatus; ovarii lobi distantes compressi, vix ad 0·5 mm. elevati; stigmata 5, subulata, 1·25 mm. longa; capsulae anni prioris reliquias sepalorum petalarumque ferentes, expansae 1 cm. diam., valvis late patentibus, deinde recurvis, post expandentes non iterum claudentes, valvis erectis, prope apicem incurvis.

South West Africa: locus ignotus, comm. *H. M. Holloway* 66. Fl. Jul. 1937.

A plant of this species, received from Windhoek under the same number and at the same time as the rest of the material described above, flowered at Kirstenbosch (N.B.G. 2136/37) in Aug. 1938. The leaves were up to 2·7 cm. long and 7 mm. broad and the same in diameter; sepals up to 7 mm. long; petals up to 2 cm. long, 2 mm. broad; stigmas up to 2 mm. long.

Lampranthus globosus L. Bol. forma—Erectus glaber; rami plures visi, sat graciles, ad 22 cm. longi, basi 1·5—3 mm. diam., internodiis pallide brunneis, 1—5·5 cm. longis; ramuli ascendentes, ad 18 cm. longi; folia sat mollia, matura saepe falcata, fere erecta vel demum patentia vel recurva vel 1 folium paris erectum alterum patens, supra plana linearia, acuta vel acuminata, dorso rotundata, lateribus leviter convexis vel altero plano, lat. visa prope apicem angustata subcompressaque, acuta vel acuminata, pallide glauce viridia, ad 2·5 cm., saepius 1·5—2 cm., longa, vagina subnulla, medio 1—2 mm. lata, 1·5—2 mm. diam.; flores laxe 3-nati vel irregulariter 2-ternati, 4—4·5 cm. diam.; pedunculi teretes graciles, 4·5—8 cm. longi, laterales parum supra medium bracteati, bracteis foliis simillimis, receptaculum semiglobosum vel fere cyathiforme, interdum basi subtruncatum, apice leviter constrictum, 3—4 mm. longum, 4—5 mm. diam.; sepala 5, valde inaequilonga, superne subulata, subula ad 7 mm. longa, 4—8 mm., vel 5—10 mm., longa, basi 2 mm. lata, interiora ample marginata; petala ca. 6-seriata, sat laxa, exteriora inferne leviter angustata, obtusa vel emarginata vel subacuta, purpureorosea, basi pallida, nitentissima, dorso pallidiora sordidioraque, interiora acuta, intima capillaria, ad stamina appressa, 4—18 mm., vel rarius ad 20 mm., longa, 0·25—1·75 mm. lata; staminodia nulla; filamenta ca. 4-seriata, erecta rosea, ad 3 mm. longa, interiora basi papillata; discus obscure crenulatus; ovarii lobi erecti approximati, ad 0·5 mm. elevati; stigmata 5, subulata, breviter caudata, ad 2·25 mm. longa.

Cape Province: in dit. Vanrhynsdorp, Vanrhyn's Pass, Sept. 1959, *Frank Stayner* (Karoo Garden 216/59). Fl. Sept.—Oct. 1960.

Conophytum littlewoodii—Plantae 2 visae, caespitosae, caule 4—8 mm. diam., reliquiis senectissimis induratis atratisque, ceteris papyraceis, brunneis vel pallide griseis; corpuscula dense crebra, glabra viridia, omnino viride punctata, punctis non lineas formantibus, lat. visa oblonga vel subquadrata vel demum propter lobos divergentes circuitu cordata, ecarinata (dorso apiceque loborum obtusis), 1—1·4 cm. longa, medio ad 9 mm. diam., vagina ad 1 cm. longa, lateribus convexis, medio ad 7 mm. lata, lobis supra visis obtusis vel rotundatis, lat. visis subquadratis truncatis, medio saepius leviter excavatis, 4—5 mm. longis, basi 4—5 mm. latis; flores diurni; pedunculus 3 mm. longus, basi bracteatus; receptaculum 1·5 mm. longum, 2 mm. diam.; calyx ad 6 mm. longus, tubo tenuiter herbaceo vel membranaceo, 4 mm. longo, segmentis herbaceis subaequilongis; corolla 1·5—2 cm. longa, tubo superne leviter ampliato, pallido, 8—11 mm. longo, segmentis 2-seriatis obtusis roseis, 1·5—2 mm. latis; stamina 4—5-seriata, seriebus 2 superioribus exsertis, filamentis luteis vel aureis, antheris pollineque laete luteis; disci segmenta truncata; ovarium supra medio conice elevatum, altitudinem disci excedens; stylus 7—8 mm. longus; stigmata 5, 3—3·5 mm. longa.

South West Africa: "10 miles north of the Orange River on the Goodhouse—Warmbad Rd.", Oct. 1959, *R. C. Littlewood.* (Karoo Garden 711/59.) Fl. Mart. 1960. Mr. Littlewood in a note adds that "this species was growing on the side of a steep koppie in very broken stone, so unlike the rest of the stone-loving species which like fixed rocks, often with crevices to grow in".

Conophytum senarium.* —Plantae plures visae, caespitosae glabrae, reliquiis persistentibus inferne subpergamentaceis, novellis pallide brunneis, superne (lobis) induratis saturatioribus; corpuscula supra medium punctata, viridia, lateribus convexis, lat. visa oblonga vel subquadrata, 1·2—2 cm. longa, medio vaginae 4—6 mm. lata, 7—10 mm. diam., lobis 4—5 mm. longis, fere erectis vel demum per 5 mm. divergentibus, vix carinatis, lat. visis apice oblique rotundatis vel oblique subtruncatis, supra visis obtusis vel subacutis, parte pellucida inconspicua subquadrata; pedunculus prope basim bracteatus; calyx novellus herbaceus, cum aetate membranaceus, 7—9 mm. longus, tubo incluso,

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* senarium = consisting of six each.

segmentis 6, inaequilongis, 2·5—4 mm. longis; corolla 2 cm. longa, tubo fere cylindrico pallido, 7—8 mm. longo, segmentis 2-seriatis subaequilongis, inferne angustatis, obtusis vel rarius paucis acutis, roseis, inconspicue saturatiore vittatis, ad 2·5 mm. latis; stamina 3—4-seriata, infima prope basim, suprema apice, tubi posita, filamentis albis, ad 6 mm. longis, antheris pollineque luteis; disci segmenta truncata; ovarium supra medio conice elevatum, altitudinem disci excedens; stylus 4—5 mm. longus; stigmata 6, 7—10 mm. longa.

Cape Prov.: ? Bushmanland; Aggenys, inter Namies et Springbok, *H. Hall* (N.B.G. 788/53). Fl. Apr. 1960.

The following key indicates how the five closely allied species of this group may be distinguished from one another—

1. Bodies entirely glabrous.
  2. Sepals and stigmas 5; style much longer than the stigmas .. *littlewoodii*
  2. Sepals and stigmas 6; style shorter than the stigmas .. *senaria*
1. Bodies entirely or partly pubescent.
  3. Sepals and stigmas 5.
    4. Bodies entirely papillately pubescent; lobes in profile truncate, with a red margin .. .. *marginatum*
    4. Bodies with upper surface of lobes only papillately pubescent towards the base; lobes in profile rounded at the apex, without a red margin .. .. *eenkokerense*
  3. Sepals (? 6) and stigmas 6 .. .. *triebneri**

Cylindrophyllum hallii.—**C. comptonii** proxime accedit, sed foliis brevioribus crassioribusque; pedunculo in vagina bractearum incluso (itaque flores quasi sessiles); receptaculo globose obconico; ovario supra minus elevato, ad basim lobato, lobis distantibus, acute compressis, praecipue differt.—Tuberculum in loculis capsulae (in **C. comptonii** non notatum) os complens vel fere complens, maximum in genere adhuc notatum.

Habitus generis; plantae ad 10 cm. altae, senectissimae ad 20 cm. diam. vel ultra; partes herbaceae cinereo virides; rami primarii reliquias induratas atratasque 5—6 annorum ferentes, ad 1 cm. diam.; folia supra plana acuta, superne obscure carinata, lateribus convexis, lat. visa superne non vel leviter angustata, obtusa vel apice rotundata, 6—7·5 cm. longa, medio 5—7 mm. lata, 10—12 mm. diam.; flores demum ad 6·5 cm. diam., diurni; pedunculo 6—7 mm., fructifero 8—10 mm., longo; bracteae 5—6 cm. longae; receptaculum 8—10 mm. longum, ad 1·4—1·7 cm. diam.; sepala 5 vel rarius 6—7 (2 parva), fere a basi superne gradatim angustata, acuta, maxima visa 1·3—2·4 cm. longa, basi 5—8 mm. lata;

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* An insufficiently known species, described without flowers, but capsule stated by Dr. Schwantes to be 6-locular and the bodies to be shortly pubescent ("hirta") with conspicuous separate green dots ("punctis solitariis viridibus conspicue picta"). Included in **C. marginatum** Lav. by Dr. Tischer.

petala 3—4-seriata, inferne levissime angustata, saepius obtusa, albida (cream), 2—3·2 cm. longa, 0·5—1·5 mm. lata; staminodia permulta, stamina conferta permulta aequantia vel excedentia, apicem versus demum flexuosa, ad 1·5 cm. longa; filamenta ca. 10-seriata, inferne albida, superne aurea, ad 1·3 cm. longa, antheris pollineque aureis; discus inconspicuissimus; ovarium supra pallidissime viride, ad 2 mm. elevatum; stigmata 5, subulata, 2—4 mm. longa, ad 2 mm. diam.; capsula atrata, maxima visa 1·8 cm. longa; 1·5 cm., apice 1 cm., expansa 2·4. cm. diam., infra obconica, 1·2 cm. longa, suturis valde compressis, valvis late patentibus, marginibus valde reflexis, carinis inferne distantibus parallelisque, superne leviter divergentibus, alis apicem valvae attingentibus, alis tegentibus valde profundeque compressi.

Cape Prov.: Bushmanland; Brakfontein, Aug. 1960, *H. Hall* N.B.G. 767/60. Fl. Oct.—Nov. 1960.

I am indebted to Mr. Hall for the following interesting field notes:—

"Only one small colony of the *Cylindrophyllum* was seen, consisting of approximately 100 plants, varying from young specimens 2 inches in diameter to very old which were 6 to 8 inches in diameter.

The geology of Brakfontein is largely granite—the home of *Lithops otzeniana* Nel—with a single and prominent outcrop of dark, crumbly shale in the form of twin koppies. The *Cylindrophyllum* was observed only on the eastern slope of the saddle between the two peaks, in association with *Stomatium murinum* (*Haw.*) *Schwant.* and the thistle-like *Codon royenii Linn.*

The crowded masses of persistent capsules were conspicuous and a single capsule, taken at random upon arrival at Kirstenbosch, contained numerous seeds. These germinated in ten days and more than 100 seedlings are now growing.

Brakfontein is in a region of low rainfall and it is evident that the seeds are not all readily dispersed and retain their vitality for very long periods."

Ruschianthus, gen. nov.—Ad **Delosperma** proxime accedit sed petalis basi coalitis, staminodiis staminibusque adnatis, stigmatibus insigniter brevibus praecipue differt.

Plantae plures visae, glabrae, 5—7 cm. altae, 9—13 cm. diam.; radix lignosa vel subtuberosa; partes herbaceae minute asperulae, pallide glauce virides; rami primarii inferne basibus crebris induratis foliorum onusti; ramuli floriferi 4-foliati; folia ascendentia falcata, supra plana acuta, lateribus inferne convexis, superne valde compressis, carina inferne obscura, superne acuta, inconspicue rosea, lat. visa e medio superne ampliata, prope apicem rotundata, deinde truncata, juniora apiculata, 2 paris inaequalia, majora 3—4·5 cm. longa, medio 5—6 mm. lata, ad 1·8 cm. diam.; flores 1—2-nati (laterale alabastro 1, bracteolato viso, itaque demum 3-nati ?); pedunculus fere teres, ad 1·2 cm. longus, basi bracteatus, bracteis foliis simillimis, 2·2 cm. et 3·2 cm., vel 3 cm. et 3·2 cm. longis; receptaculum globose obconicum, ad 6 mm. longum, ad 9 mm. diam.; sepala 5, acute carinata, acuta, 9—11 mm. longa, basi 4—7 mm. lata, interiora apice subulata, sat anguste marginata; petala ca. 5-seriata, intima in staminodia abeuntia, inferne e medio leviter angustata, apice rotundata, basi per ad 1·5 mm. coalita, pallidissime citrina, ad 1·4 cm. longa, 0·25—1·25 lata; staminodia ad stamina conferta adpressa eaque excedentia, minute nitenteque glandulifera, ad 1 cm. longa, cum staminibus corollae adnata; filamenta ca. 8-seriata citrina, exteriora epapillata, interiora prope medium papillata, ad 8 mm. longa, antheris pollineque aureis; glandulae nectariferae 5, subdistantes semilunatae, obscure crenulatae; ovarium supra dimidio exteriore concavum, interiore abrupte elevatum, conum obtusum formans, 1·5 mm. altum, lobis approximatis, obtuse compressis, profunde sulcatis itaque ovarium quasi 10-lobatum; stigmata 5, subulata contigua incurva, vix 1 mm. longa; capsula senectissima tantum visa, alis tegentibus nullis.

Species 1, **R. falcatus.**

South West Africa; Numeis, Mart. 1960, *E. Rusch* (N.B.G. 259/60). Fl. Oct.—Nov. 1960.

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(*To be continued.*)

CHROMOSOME NUMBERS IN GASTERIA, ASTROLOBA AND HYBRIDS

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Since lists of chromosome numbers have recently been published for *Aloë* (Riley, 1959c) and *Haworthia* (Riley, 1960a) based on both the writer's (Riley, 1958, 1959a) observations and those of others, it seems desirable to round out the tribe Aloineae by listing the results of studies that have been reported on *Gasteria, Astroloba* (*Apicra*), *Poellnitzia* and intergeneric hybrids. Some of these observations have been made by the author during recent years and will be combined with the results published by other investigators.

In Table 1 are listed the species of *Gasteria* that have been studied, the haploid or diploid numbers that have been recorded and the investigators who made the observations. Table 2 gives similar information for *Astroloba* (*Aprica*) and *Poellnitzia.* In Table 3 are given the results of studies on hybrids between *Gasteria* and *Haworthia* (= *Gasterhaworthia*), on those between *Gasteria* and *Astroloba*, and on *Gasteria-Aloë* hybrids (= *Gastrolea*). All the genera, including the hybrids, are arranged according to Jacobsen's (1954) *Handbuch der sukkulenten Pflanzen* which, although not entirely satisfactory, is the most recent treatment of the group.

In tabulating the number of diploid and polyploid plants, Jacobsen's (1954) *Handbuch* will be followed rigidly as this method is the only one that ensures uniformity. Therefore, for example, *G. disticha* (L.) Haw. will be counted only once even though it has also been published as *G. lingua* Bgr.; synonyms of other species will also be omitted from the tabulation.

In *Gasteria*, 44 identified species and four varieties of them were studied. Of the species, 43 were diploids and one had both diploid and tetraploid individuals whilst three of the varieties were diploid and one had 4*n* chromosomes. The only horticultural variety listed in Jacobsen was diploid. Nine interspecific hybrids were diploids, one was a triploid and one included both diploid and tetraploid plants. Eleven plants published as species and varieties which are not listed in Jacobsen were diploids, and of 132 unidentified plants, 127 were diploid, one was a triploid and four were tetraploids. Included amongst the diploids were 50 plants from the Bushman's River Poort, Alexandria District, which resembled *G. zeyheri* very closely.

In *Astroloba*, four species were diploid (n = 7), one a triploid, one a tetraploid, one had nine chromosomes and one variety had 12. Two unidentified plants were diploid. In *Poellnitzia*, the only plant that was studied was a diploid. Most of the intergeneric hybrids were diploids including three plants of *Gasterhaworthia* and 10 of *Gastrolea*. In one study of a *Gasteria-Aloë* hybrid (Sato, 1937, 1942) both 2*n* and 4*n* individuals were found. One hybrid between *Gasteria* and *Astroloba* is listed as having "about 14" somatic chromosomes.

In *Gasteria*, 98 per cent of the named species were diploid as were 96 per cent of the named and unidentified plants taken together. This percentage is considerably higher than that found in *Haworthia* and about the same as that in *Aloë;* it indicates that apparently polyploidy has not been an important evolutionary factor in *Gasteria*. The observations on *Astroloba* and *Poellnitzia* are too few to be of significance.

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Table 1

Species of Gasteria of which the chromosomes have been counted; the chromosome numbers reported; and the literature references. The species are arranged according to Jacobsen (1954).

Species.	*n* no.	2*n* no.	References.
Species listed in Jacobsen:			
G. acinacifolia (Jacq.) Haw.	7		Riley, 1945, 1960b
		14	Sato, 1937, 1942; Riley, 1959b
G. angustifolia (Ait.) Haw.	7		Geitler, 1935; Riley, 1960b
G. angustifolia var. *laevis* (Salm.) Haw. as *G. laevis* Haw.		14	Snoad, 1951a
G. angustiarum v. Poelln.		14	Riley, 1959b
G. armstrongii Schoenl.	7		Riley, 1945, 1960b
		14	Resende, 1937; Snoad, 1951a
as *G. armstrongii*		14	Sato, 1937, 1942
G. beckeri Schoenl.		14	Snoad, 1951a; Riley, 1959b
G. brevifolia Haw.	7		Marshak, 1934; Riley, 1945, 1960b
		14	Resende, 1937; Sato, 1937, 1942; Riley, 1959b
as *G. braclyphylla* (= *G. brachyphylla* ?)		14	Sato, 1937, 1942
G. caespitosa v. Poelln.		14	Riley, 1959b
G. carinata (Mill.) Haw.	7		Riley, 1960b
		14	Resende, 1937
as *G. carinata* Duval		14	Snoad, 1951a
as G. *carinata* (no author)	7		Marshak, 1934
		14	Sato, 1937, 1942
G. colubrina N. E. Br.		14	Snoad, 1951a
G. conspurcata (Salm.) Haw.	7		Riley, 1960b
as *G. lingua* var. *conspurcata*	7		Ferguson, 1926
G. croucheri (Hook. f.) Bak.		14	Snoad, 1951a
G. decipiens Haw.		14	Riley, 1959b

Species.	*n* no.	2*n* no.	References.
Species listed in Jacobsen—*Continued*			
G. dicta N. E. Br.	7		Riley, 1960b
G. disticha (L.) Haw.	7		Marshak, 1934
as *G. lingua* Bgr.	7		Ferguson, 1926; Marshak, 1934
		14	Resende, 1937
G. elongata Bak.	7		Marshak, 1934.
G. ernesti-ruschii Dtr.		14	Riley, 1959b
G. fasciata (Salm.) Haw.	7		Kondo and Megata, 1943; Riley, 1960b
		14	Kondo and Megata, 1943
G. fuscopunctata Bak.	7		Riley, 1960b
as *G. excelsa*	7		Ferguson, 1926
G. glabra Haw.	7		Riley, 1960b
		14	Resende, 1937; Riley, 1959b
G. gracilis Bak.			
as *G. gracilis* v. Poelln. (?)		14	Kondo and Megata, 1943
G. humilis v. Poelln.		14	Riley, 1959b
G. laetipunctata Haw.	7		Riley, 1960b
as *G. laetepunctata*	7		Riley, 1945
		14	Resende, 1937
G. liliputana v. Poelln.		14	Snoad, 1951a; Riley, 1959b
G. maculata (Thunbg.) Haw.		14	Resende, 1937
	7		Riley, 1960b
		28	Sato, 1937, 1942
as *G. nigricans platyphylla*	7		Ferguson, 1926
G. mollis Haw.	7		Marshak, 1934; Riley, 1960b
G. neliana v. Poelln.		14	Resende, 1937; Riley, 1959b
G. nigricans Haw.	7		Marshak, 1934; Riley, 1945, 1960b
		14	Resende, 1937; Sato, 1937, 1942; Riley, 1959b
		28	Ferguson, 1926; Kondo and Megata, 1943,
G. nigricans var. *crassifolia* (Ait.) Haw.		28?	Ferguson, 1926
G. nitida (Salm.) Haw.	7		Riley, 1945, 1960b
		14	Resende, 1937
G. obtusa (Salm.) Haw.		14	Resende, 1937
G. obtusifolia (Salm.) Haw.	7		Riley, 1945, 1960b
		14	Resende, 1937
G. parviflora Bak.	7		Riley, 1945, 1960b
G. planifolia Bak.	7		Marshak, 1934; Riley, 1945, 1960b
		14	Resende, 1937; Sato, 1937, 1942
G. poellnitiziana Jacobsen		14	Riley, 1959b
G. prolifera Lem.	7		Jähnl, 1947; Geitler, 1935
G. pseudonigricans (Salm.) Haw.	7		Riley, 1960b
G. pulchra (Ait.) Haw.	7		Marshak, 1934
		14	Resende, 1937; Kondo and Megata, 1943; Snoad, 1951a; Riley, 1959b
G. retata Haw.	7		Ferguson, 1926
		14	Riley, 1959b

Species.	*n* no.	2*n* no.	References.
Species listed in Jacobsen—*Continued*			
G. schweickerdtiana v. Poelln.		14	Riley, 1959b
G. subcarinata (Salm.) Haw.	7		Marshak, 1934
G. subverrucosa (Salm.) Haw.		14	Riley, 1959b
G. sulcata (Salm.) Haw.	7		Marshak, 1934; Riley, 1945, 1960b
G. trigona Haw.	7		Riley, 1960b
		14	Resende, 1937
G. verrucosa (Mill.) Duv.	7		Marshak, 1934; Riley, 1960b
		14	Riley, 1959b; Taylor, 1924
as *G. verrucosa* Haw.		14	Resende, 1937; Kondo and Megata, 1943
G. verrucosa var. *asperrima* (Salm.) v. Poelln.	7		Riley, 1960b
G. verrucosa var. *latifolia* Haw.		14	Sato, 1937, 1942
G. zeyheri (Salm.) Bak.	7		Jähnl, 1947; Riley, 1960b
Horticultural varieties:			
G. croucheri var. *spathulata* HORT. KEW	7		Ferguson, 1926
Putative intrageneric, interspecific hybrids:			
G. brevifolia × *G. nigricans*	7		Riley, 1945, 1960b
G. brevifolia × *G. nigricans*	7		Riley, 1945, 1960b
G. brevifolia × *G. planifolia*	7		Riley, 1945, 1960b
G. cheilophylla × Bak. (= *G. verrucosa* × *G. pulchra*)	7		Ferguson, 1926; Riley, 1960b; Geitler, 1935
		14, 28	Sato, 1937, 1942
as *G. cheylophylla* Bak.		14	Resende, 1937
G. margaritifera × Bgr.	7		Riley, 1960b
		14	Sato, 1942
G. planifolia × *G. nigricans*	7		Riley, 1945, 1960b
G. planifolia × *G. sulcata*	7		Riley, 1960b
G. pulchra × *G. planifolia*	7		Riley, 1945, 1960b
G. sulcata × *G. nigricans*		21	Riley, 1948a
G. sulcata × *G. planifolia*	7		Riley, 1960b
G. verrucosa × *G. brevifolia*	7		Riley, 1945, 1960b
G. verrucosa × *G. pulchra*	7		Riley, 1960b
Species and varieties not listed in Jacobsen (1954):			
G. cooperi	7		Ferguson, 1926
G. depressa	7		Geitler, 1935
G. disticha var. *comprucata* (=*G. conspurcata* ?)		14	Sato, 1937, 1942
G. gracilia var. *minima*		14	Sato, 1942
G. lingua var. *conspurcata*	7		Ferguson, 1926
G. minima v. Poelln.		14	Kondo and Megata, 1943
G. multipunctata		14	Sato, 1937, 1942
G. nigricans var. *fasciata*	7		Riley, 1945
G. obscura		14	Sato, 1937, 1942
G. rotata	7	14	Ferguson, 1926
G. rurex Hort.		14	Snoad, 1951a
G. vittata		14	Resende, 1937; Sato, 1937, 1942
Unidentified plants:			
G. "aruhero"		14	Sato, 1937, 1942

Species.	*n* no.	2*n* no.	References.
G. sp. "Gyu-zetu"		14	Kondo and Megata, 1943
G. sp. HORT.		14	Snoad, 1951a
G. sp. (resembling *G. zeyheri*) (50 plants)		14	Riley, 1959b
G. sp. (48 plants)		14	Riley, 1959b
G. sp. (2 plants)		14	Resende, 1937
G. sp. (1 plant)	7	14	Taylor, 1931
G. sp. (23 plants)		14	Snoad, 1951b
G. sp. (1 plant)		21	Snoad, 1951b
G. sp. (1 plant)		28	Resende, 1937
G. sp. (3 plants)		28	Snoad, 1951b

TABLE 2.

Species of Astroloba (Apicra) and Poellnitzia of which the chromosomes have been counted; the chromosome numbers reported; and the literature references. The species are arranged according to Jacobsen (1954).

Species.	*n* no.	2*n* no.	References.
Astroloba (*Apicra*)			
A. aspera (Willd.) Uitew.	7		Ferguson, 1926
as *Haworthia aspera*		14	Snoad, 1951a
A. bicarinata (Haw.) Uitew.		21	Resende, 1937
A. congesta (Salm.) Uitew.	9		Marshak, 1934
A. deltoidea (Hook. f.) Uitew.	7	14	Ferguson, 1926
		14	Resende, 1937
A. foliosa (Willd.) Uitew.		14	Resende, 1937
A. pentagona (Haw.) Uitew.			
as *A. pentagona* Willd.		28	Resende, 1937
as *Haworthia spiralis* Haw.		14	Sato, 1937, 1942
A. pentagona var. *spiralis* (Haw.) Uitew.	12		Ferguson, 1926
A. spiralis (L.) Uitew.			
as *A. spiralis* (L.) Bak.		14	Resende, 1937; Kondo and Megata, 1943
A. sp.	7		Geitler, 1935; Suto, 1936
A. sp.		14	Riley, 1959b
Poellnitzia			
P. rubriflora (L. Bol.) Uitew.			
as *Apicra rubriflora* L. Bol.		14	Resende, 1937

TABLE 3.

Chromosome numbers of intergeneric hybrids in the Aloineae; the hybrids are listed according to Jacobsen (1954).

Hybrid.	*n* no.	2*n* no.	References.
Gasterhaworthia × Guill.			
G. × *bayfieldii* (S. D.) Rowley		14	Rowley, 1954
as *Gasteria bayfieldii* Bak.		14	Snoad, 1951a
G. × *holtzei* (Radl.) Guill.			
as *Gasteria Holtzei*	7		Ferguson, 1926
G. × sp. (*Haworthia* sp. × *Gasteria* sp. (?))		14	Kondo and Megata, 1943
Gasteria × *Astroloba*			
Gasteria × *apicroides* Bak.		ca. 14	Ferguson, 1926

Hybrid.	*n* no.	2*n* no.	References.
Gastrolea × E. Walth. (= *Gasteria* × *Aloë*)			
G. × *bedinghausii* (Radl.) E. Walth. as *Aloë aristata* × *Bedinghausii* Radl.		14	Resende, 1937
G. × *beguinii* (Radl.) E. Walth. as *Aloë aristata* × *Beguinii* Hort.		14	Resende, 1937
G. × *lapaixii* (Radl.) Jacobs. as *Aloë aristata* × *Lapaixii* Radl.		14	Resende, 1937
Gasteria "gyuzetu" × *Aloë variegata*		14	Sinoto and Sato, 1940
		14, 28	Sato, 1937, 1942
Gasteria sp. × *Aloë* sp.	7		Riley, 1947, 1948b, 1950
Aloë variegata × *Gasteria* "gyuzetu"		14	Sinoto and Sato, 1940; Sato, 1942
Aloë variegata × *Gasteria* sp. "Seiryuto" (?)	7	14	Kondo and Megata, 1943
Aloë variegata × *Gasteria verrucosa*	7	14	Kondo and Megata, 1943
Aloë variegata × *Gasteria verrucosa* var. *latifolia*		14	Sato, 1937, 1942; Sinoto and Sato, 1940
Gasteria verrucosa × *Aloë variegata*	7	14	Kondo and Megata, 1943

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A NEW ALOE FROM TANGANYIKA TERRITORY

By G. W. Reynolds

(With Plates XI and XII)

ak. et
ginibus
ianthii

dicibus

)(—20)
subtus
albidis

unculus
umina-
acutae,

ERRATA

Journal of South African Botany, Vol. XXVII Part I. Notes on Mesembryanthemum and Allied Genera. by H. M. L. Bolus. Page 48, line 4, for "W. F. Stayner" read "F. J. Stayner".

8—10 mm. longae, 5—6 mm. latae, albidae, scariosae, reflexae, 3—5-nervatae. *Pedicelli* 4—5 mm. longi. *Perianthium* pallide coccineum, 30 mm. longum, circa ovarium 6 mm. diametro, hinc leviter constrictum (4 mm.) fauces versus leviter ampliatum; *segmenta exteriora* per 8 mm. libera. *Antherae* 3 mm. exsertae. *Stigma* demum 4—5 mm. exserta. *Ovarium* 3½ mm. longum, 2½ mm. diametro. (Plates XI and XII.)

Tanganyika Territory. Kahama District, 15 miles south of Mbugwe, c. 3° 32′ S., 31° 15′ E., alt. 4,000 ft., fl. 5 August 1950, A. A. Bullock 3076 holotype (K); Bula District, Murungu-Nyamgalika, c. 4° 14′ S., 31° 11′ E., alt. 4,000 ft., fl. 20 August 1950, Bullock 3195 (K); coll. Bullock 15 miles south of Mbugwe, cult. Bryanston, Johannesburg, fl. 23 August 1960, Reynolds 9525 (PRE).

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A NEW ALOE FROM TANGANYIKA TERRITORY

By G. W. Reynolds

(With Plates XI and XII)

Aloe bullockii Reynolds. Species nova, *A. kniphofioides* Bak. et *A. buettneri* Berger affinis, ab ambobus foliis 2—3 cm. latis, marginibus ciliatis dentibus cartilagineis mollibus ½—1 mm. separatis, perianthii forma differt.

Planta bulbo subterraneo 3 cm longo 3—4 cm. diam., radicibus crassis fusiformibus.

Folia 8—10, rosulata, patula recurvula, anguste lanceolata, 10(—20) cm. longa, 2(—3) cm. lata; *supra* canaliculata, viridula, lineata; *subtus* convexa, viridula, lineata; marginibus dentibus cartilagineis albidis ½—1 mm. longis, ½—1 mm. distantibus ciliata.

Inflorescentia simplex vel 1-ramosa, 35—50 cm. alta. *Pedunculus* basi plano-convexus et 8 mm. latus. *Racemus* cylindricus leviter acuminatus, 7—10 cm. longus, 5 cm. diametro. *Bracteae* late ovato-acutae, 8—10 mm. longae, 5—6 mm. latae, albidae, scariosae, reflexae, 3—5-nervatae. *Pedicelli* 4—5 mm. longi. *Perianthium* pallide coccineum, 30 mm. longum, circa ovarium 6 mm. diametro, hinc leviter constrictum (4 mm.) fauces versus leviter ampliatum; *segmenta exteriora* per 8 mm. libera. *Antherae* 3 mm. exsertae. *Stigma* demum 4—5 mm. exserta. *Ovarium* 3½ mm. longum, 2½ mm. diametro. (Plates XI and XII.)

Tanganyika Territory. Kahama District, 15 miles south of Mbugwe, c. 3° 32′ S., 31° 15′ E., alt. 4,000 ft., fl. 5 August 1950, A. A. Bullock 3076 holotype (K); Bula District, Murungu-Nyamgalika, c. 4° 14′ S., 31° 11′ E., alt. 4,000 ft., fl. 20 August 1950, Bullock 3195 (K); coll. Bullock 15 miles south of Mbugwe, cult. Bryanston, Johannesburg, fl. 23 August 1960, Reynolds 9525 (PRE).

Our very distinctive new species is named after Mr. A. A. Bullock of Kew, who discovered it in August 1950 in burnt woodland fringing the east "bank" of the Mogowosi River, which runs almost north to south in a botanically little-known area which is depopulated because of sleeping sickness.

Mr. Bullock found plants 15 miles south of Mbugwe in the Kahama District, and also further south in the Buha District, flowering after bush fires in August 1950.

Plants given to Mr. L. D. E. F. Vesey-FitzGerald at Abercorn, Northern Rhodesia, did not thrive or flower and some were given to me to try in Johannesburg. Eventually, in August 1960, one of these plants flowered which enabled the description to be completed.

A. bullockii is one of the very few species of Aloe having an underground bulb. It is allied to the South African small species *A. kniphofioides* Bak. and to the considerably larger *A. buettneri* Engler (=*A. paedogona* Berger) found in Ghana, Togo, Nigeria and Angola, but differs in having leaves 10—20 cm. long, 2—3 cm. broad, with margins ciliate with crowded soft teeth that are only ½—1 mm. long, and ½—1 mm. apart.

Another noteworthy character of *A. bullockii* is that, when plants flower, towards the end of the long dry season, the leaves have dried back to 10 cm. in length, while, six months later, after heavy rains, leaves develop to 20 cm. in length and are more spreading-recurved.

Description: *Plant* with thick fusiform roots and with an underground bulb that is 3 cm. tall and 3—4 cm. diam. at the middle.

Leaves 8—10, rosulate, spreading to recurved, linear-lanceolate, 10 cm. long and 2 cm. broad when flowering at the end of the dry season, reaching 20 cm. long, 3 cm. broad at the middle in the rainy season; *upper surface* canaliculate, green, lineate, the lines alternately lighter and deeper green in colour, without spots; *lower surface* rounded, similar to upper surface in colour and lineation; *margins* with continuous cartilaginous narrow edge ciliate with crowded soft pale-pink teeth about ½—1 mm. long, ½—1 mm. apart.

Inflorescence simple or 1-branched, 35—50 cm. tall.

Peduncle plano-convex and 8 mm. broad at base; when 1-branched the branch subtended at base by a scarious, thin many-nerved bract 12 mm. long, 5 mm. broad.

Raceme cylindric, slightly acuminate, 7—10 cm. long, about 5 cm. diam.

Bracts broadly ovate-acute, deflexed, 8—10 mm. long, 5—6 mm. broad, thin, scarious, white, 3—5-nerved.

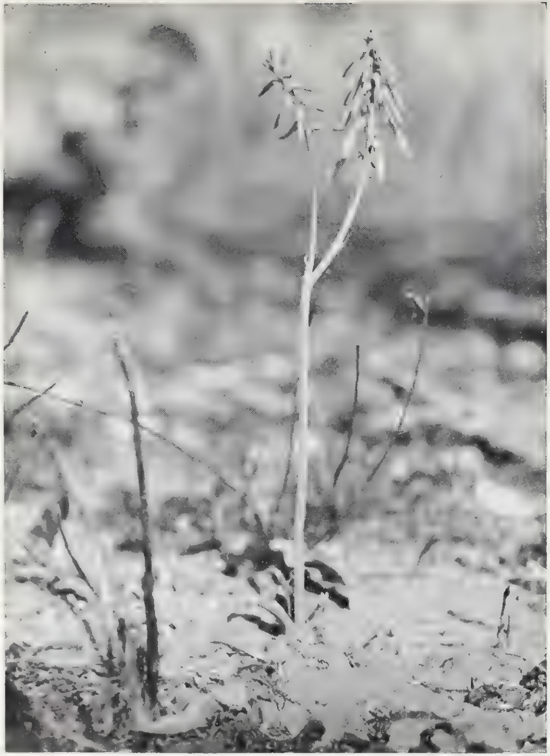

Fig. 1.

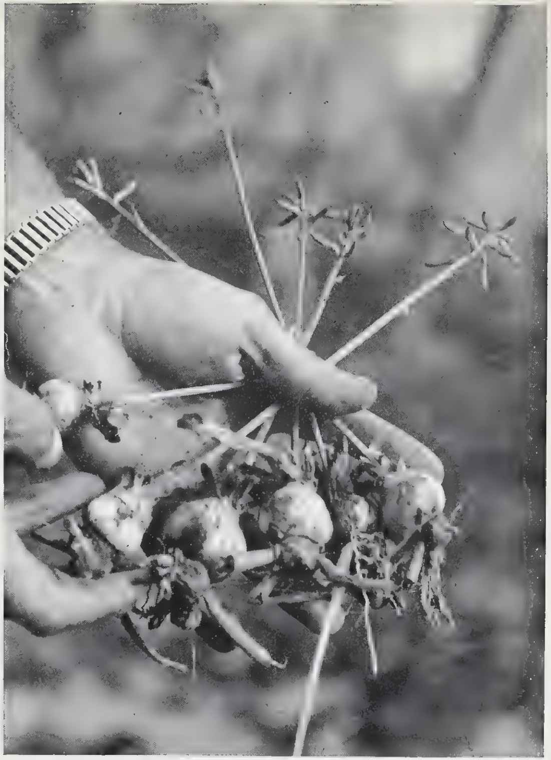

Fig. 2.

Plate XI. *Aloe bullockii* Reynolds.

Fig. 1.—Plant flowering in natural habitat; height 45 cm.
Fig. 2.—Uprooted plants showing bulbs and fusiform roots; x $\frac{1}{4}$ approx.
(*Photos: Mr. A. A. Bullock.*)

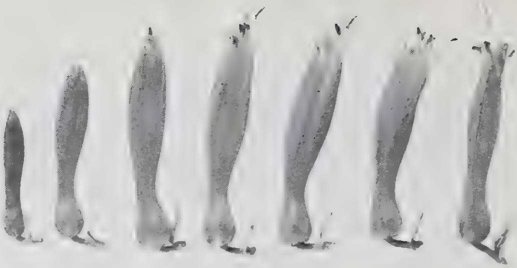

Fig. 1.

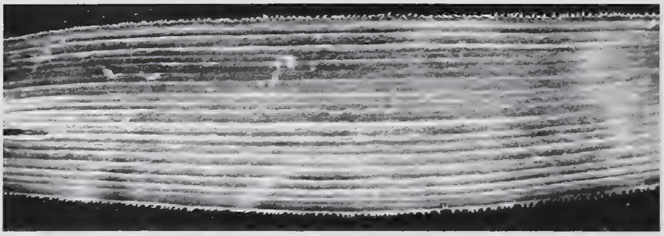

Fig. 2.

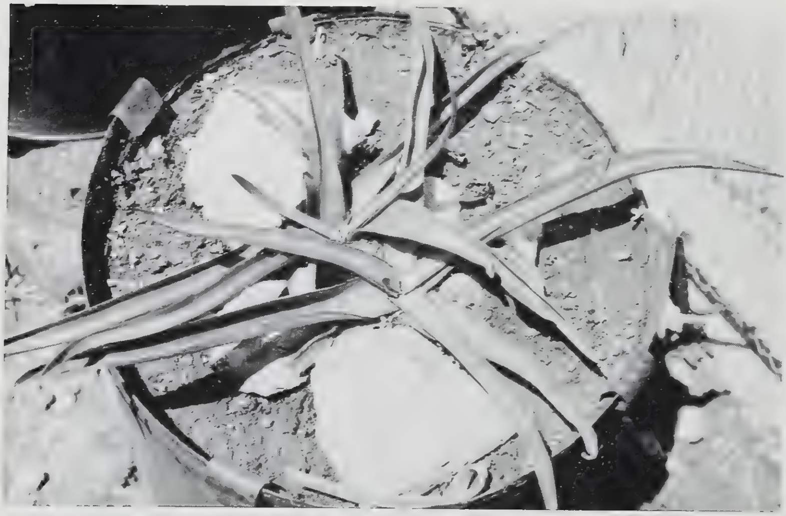

Fig. 3.

Plate XII. *Aloe bullockii* Reynolds
Fig. 1. Flowers 1/1 from bud to post-pollination stage.
Fig. 2. Portion of leaf (after rains) x 1/1.
Fig. 3. Cultivated plants (after rains) x 1/3 approx.

Pedicels 4—5 mm. long.

Perianth pale scarlet to coral-red, 30 mm. long, basally flat, 6 mm. diam. across the ovary, constricted to 4 mm. above the ovary, thence enlarging and slightly contracted at the throat; *outer segments* free for 8 mm., obscurely nerved, the apices subacute; *inner segments* orange, broader than the outer, with pale-scarlet keel, and more obtuse apices.

Filaments lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 3 mm.

Stigma at length exserted 4—5 mm.

Ovary pale brown, 3½ mm. long, 2½ mm. diam.

ACKNOWLEDGMENTS

I am deeply indebted to:

Mr. A. A. Bullock of Kew, for several photographs and for much data.

Mr. L. D. E. F. Vesey-FitzGerald, Principal Scientific Officer, Abercorn, Northern Rhodesia, for three plants, originally collected by Mr. A. A. Bullock, and for much other assistance.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for the facilities of the National Herbarium and for photographs.

The South African Council for Scientific and Industrial Research for travelling grants that have enabled me to investigate the Aloes in many parts of Africa.

A NEW ALOE FROM SOMALI REPUBLIC (FORMERLY SOMALILAND PROTECTORATE)

By G. W. Reynolds

(With Plates XIII and XIV)

Aloe cremnophila Reynolds et Bally. Species nova, *A. tororoanae* Reynolds affinis, caulibus gracilioribus, basi multo ramosis, foliis immaculatis, racemis grandioribus, bracteis grandioribus pedicellis aequilongis, planta tota pendenti differt.

Planta pendens, caulibus e basi ramosis, 10—20 cm. longis, 8—10 mm. diam. *Folia* 6—8, rosulata, anguste lanceolato-attenuata, 10 cm. longa, 2 cm. lata, patula, recurvula; *supra* glauco-viridula, basi plana, superne plana vel leviter canaliculata, immaculata; *subtus* convexa; marginibus dentibus deltoideis 2 mm. longis, 3—5 mm. distantibus munita.

Inflorescentia simplex, 25—30 cm. longa, pendens, arcuato-adscendens. *Pedunculus* gracilis, 6 mm. diam. *Racemus* cylindrico-conicus, 10—12 cm. longus, 5½ cm. diam. *Bracteae* ovato-acutae, 10 mm. longae, 5 mm. latae, 5-nervatae. *Pedicelli* 10—12 mm. longi.

Perianthium coccineum, 25 mm. longum, cylindricum, levissime clavatum, circa ovarium 5 mm. diametro; *segmenta exteriora* per 5 mm. libera. *Antherae* 0—1 mm. exsertae. *Stigma* demum 1—2 mm. exserta. *Ovarium* viridulum, 5 mm. longum, 2½ mm. diametro. (Plates XIII and XIV.)

Habitat: Somali Republic (formerly Somaliland Protectorate), on precipice faces near Daloh, 13 miles north of Erigavo, c. 10° 46′ N., 47° 15′ E., alt. 6,500 ft., cult. Bryanston, Johannesburg, fl. 7 Oct. 1960, Reynolds 8450 B, holotype (PRE).

Our new species was discovered by Mr. P. R. O. Bally in October 1956 on cliff faces of the Daloh Escarpment, about 13 miles north of Erigavo at an altitude of 7,000 ft. Mr. Bally also found plants on rocks at Mait Escarpment, at 5,400 ft., but none was then in flower.

Subsequently, on 12th September 1957, I also found plants on the precipice face at Mr. Bally's locality, but again no flowers were available.

Of several plants cultivated in my gardens at Bryanston, Johannesburg, only one stem produced an inflorescence in October 1960, and this enabled the description to be completed.

A. cremnophila appears to be nearest allied to *A. tororoana* Reynolds (from Tororo Rock in Uganda near the Kenya border) but differs in having slenderer stems, unspotted leaves, larger racemes, larger bracts as long as the 10—12 mm. pedicels, while the whole plant is pendent on cliff faces.

The simple inflorescence is produced downwards with the raceme ascending, while it seems that the flowers open one at a time. Leaves are mostly rosulate, but sometimes the apical 5—10 cm. of stems is sublaxly foliate.

DESCRIPTION: *Plant* of shrubby growth, pendent on precipice faces, with *stems* 10—20 cm. long, 8—10 mm. diam., many-branched from base.

Leaves 6—8, rosulate, usually crowded at apex of stems, basally sheathing, narrowly lanceolate-attenuate, averaging 10 cm. long, 2 cm. broad at base, spreading, recurved; *upper surface* grey-green, without spots or markings, flat low down, slightly canaliculate upwards; *lower surface* rounded, grey-green, without spots or markings; *margins* armed with deltoid rather pungent pale brown teeth that are 2 mm. long, 3—5 mm. apart.

Inflorescence simple, 25—30 cm. long, at first pendent, then arcuate-ascending.

Peduncle slender, 6 mm. diam., with a few sterile bracts below the raceme.

Raceme cylindric-conic, 10—12 cm. long, 5½ cm. diam., the buds grey-green tipped, denser, sub-erect, the open flowers scarlet, laxer, sub-pendulous.

Bracts ovate-acute, 10 mm. long, 5 mm. broad at the middle, dirty-white, rather brittle, 5-nerved.

Pedicels 10—12 mm. long.

Perianth scarlet, turning yellowish-green at mouth, 25 mm. long, cylindric, very slightly clavate, basally obtuse, 5 mm. diam., across the ovary, thence trigonous upwards, the mouth wide open; *outer segments* free for 5 mm., the apices acute, slightly spreading; *inner segments* with a greenish keel in apical 5 mm., the apices more obtuse and more spreading than the outer.

Filaments pale lemon, filiform-flattened, the 3 inner narrower and lengthening before the 3 outer, with their *anthers* in turn exserted 0—1 mm.

Stigma at length exserted 1—2 mm.

Ovary green, 5 mm. long, 2½ mm. diam.

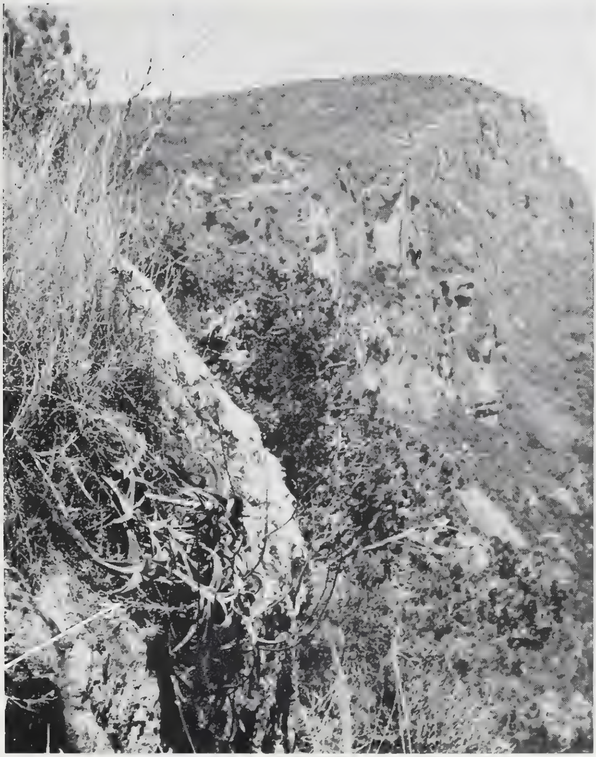

PLATE XIII. *Aloe cremnophila* Reynolds et Bally
Plants on Daloh precipice, 13 miles north of Erigavo. Alt. 6,500 ft.

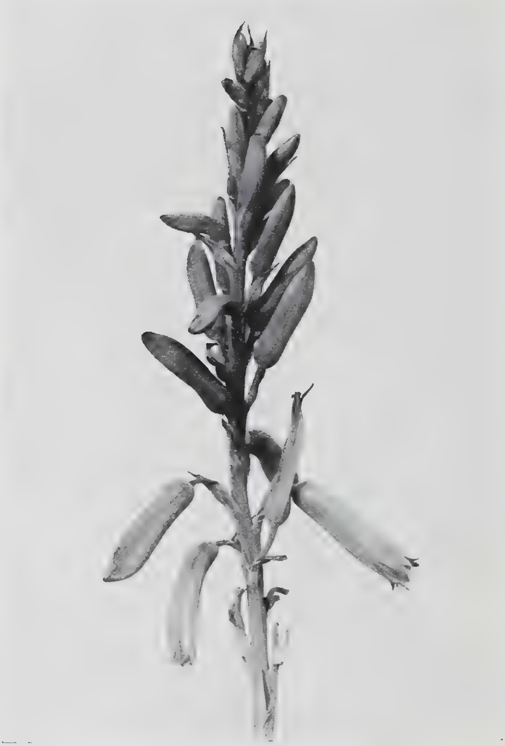

PLATE XIV. *Aloe cremnophila* Reynolds et Bally
Raceme x 8/10, from a plant flowering in Johannesburg

ACKNOWLEDGMENTS

I am deeply indebted to:

The South African Council for Scientific and Industrial Research for travelling grants that have enabled me to investigate the Aloes in many parts of Africa.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for the facilities of the National Herbarium, for photographs, and much other assistance.

A PRELIMINARY ACCOUNT OF THE EFFECT OF GRAZING UPON SPECIES OF HELICHRYSUM IN THE AMATOLE MOUNTAINS

By A. R. A. Noel
(*Department of Botany, Rhodes University*)*

ABSTRACT

In the Amatole Mountains estimates of frequency, density and cover have been obtained to ascertain the reaction of certain species of *Helichrysum* to grazing. *H. argyrophyllum*, *H. odoratissimum* and *H. splendidum* are shown to be more abundant in the presence of grazing whilst *H. miconiaefolium* is depressed by grazing. *H. adenocarpum*, *H. adscendens* and *H. glomeratum* show little or no effects.

The relationship of firing, grazing and soil erosion and of the general disturbance of natural vegetation to the distribution of *H. argyrophyllum* DC. has been under investigation for many years. Story (1952) has summarised the work of Schonland (1923, 1927) and White (1948), and has given a detailed account of the autecology of this species on the Amatole Mountains. The upland sourveld of this region, however, is rich in other species of *Helichrysum*, which, although not so abundant, show interesting reactions to their environment.

The purpose of this paper is to describe observations made in 1957 in the Amatole Mountains upon the effect of grazing on certain species of *Helichrysum*. The study was made near the summit of Tor Doone, a promontory reaching 5,135 ft. on the edge of the escarpment joining the Hogsback Mountain to Gaikas Kop in the Keiskamma District of the Eastern Cape, some 14 miles north-west of Keiskammahoek. This area adjoins, and in topography and vegetation closely resembles, that which forms the subject of *A Botanical Survey of the Keiskammahoek* by R. Story (1952). The climate, soils and general features of the vegetation are described in detail by Story and need not be repeated here.

Tor Doone is crossed by a fence which delimits pasturage on the north-west side from sourveld and macchia on the south-east. The area studied consists of a gently sloping piece of open grassland of north-easterly aspect on the crest of the escarpment. As far as could be ascertained conditions were similar on the two sides of the fence, except for the presence of sheep grazing on the south-east side. The grazing pressure was not heavy and there was no soil erosion, although the grass was short.

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*now at the University College of Rhodesia and Nyasaland.

The frequency of *Helichrysum adenocarpum* DC., *H. adscendens* (Thb.) Less., *H. argyrophyllum* DC., *H. glomeratum* Klatt., *H. miconiaefolium* DC., *H. odoratissimum* (L.) Less., and *H. splendidum* Less. was estimated by the throwing of quarter square meter Raunkiar rings. The samples were randomised as far as possible, a hundred throws being made over previously demarcated areas on each side of the fence. Unfortunately no precautions were taken to eliminate over-sampling of the centres of the plots (*vide* Greig-Smith 1952a) but this effect may have been diminished by the fact that ten samplers were working independently. The presence or absence of individuals of each species of *Helichrysum* was recorded for every throw. The results are shown in the accompanying table. Owing to the very different habits of the species they cannot be considered comparable biological units and a comparison between the species is hardly justified. The figures obtained must be regarded as indicative of certain interesting trends only. Using the method of contingency analysis (Greig-Smith 1957) the comparisons of the frequencies of *H. argyrophyllum*, *H. miconiaefolium*, *H. odoratissimum* and *H. splendidum* between the grazed and ungrazed areas are highly significant at the 0.05 level of probability. The frequencies of *H. adenocarpum*, *H. glomeratum* and *H. adscendens* within the two areas are not statistically significant, although in the case of the first two certain trends are indicated which might repay further investigation

By reference to the table it can be seen that the frequency of *H. argyrophyllum* conforms to the general findings of Story *et al.*, being greater in the grazed than in the ungrazed area. *H. odoratissimum* and *H. splendidum* both show a similar increase of frequency in the presence of grazing. With regard to *H. miconiaefolium* the converse is true. The measure of frequency gives a misleading impression of the effect of this species, for in terms of cover it is considerable, owing to the formation of large clumps by a small number of plants in the grazed area. *H. adenocarpum*, a small, few-stemmed, non tussock-forming species, appears to be more frequent in the grazed area. In fact all over the Amatole Mountains it can be observed that this species does not tolerate competition with long grass or other tall plants. Like *H. argyrophyllum* it readily colonises the sides of cattle tracks and boulder-strewn places. *H. glomeratum* also shows a slight tendency to be more frequent in the grazed area but *H. adscendens* shows no reaction to grazing.

An estimate of density is also available for each of these seven species of *Helichrysum* on Tor Doone. They are represented by widely and irregularly scattered plants. In view of clumping and the very different habit of each species the average densities per unit area are liable to be misleading. Nevertheless in comparing the density of species within

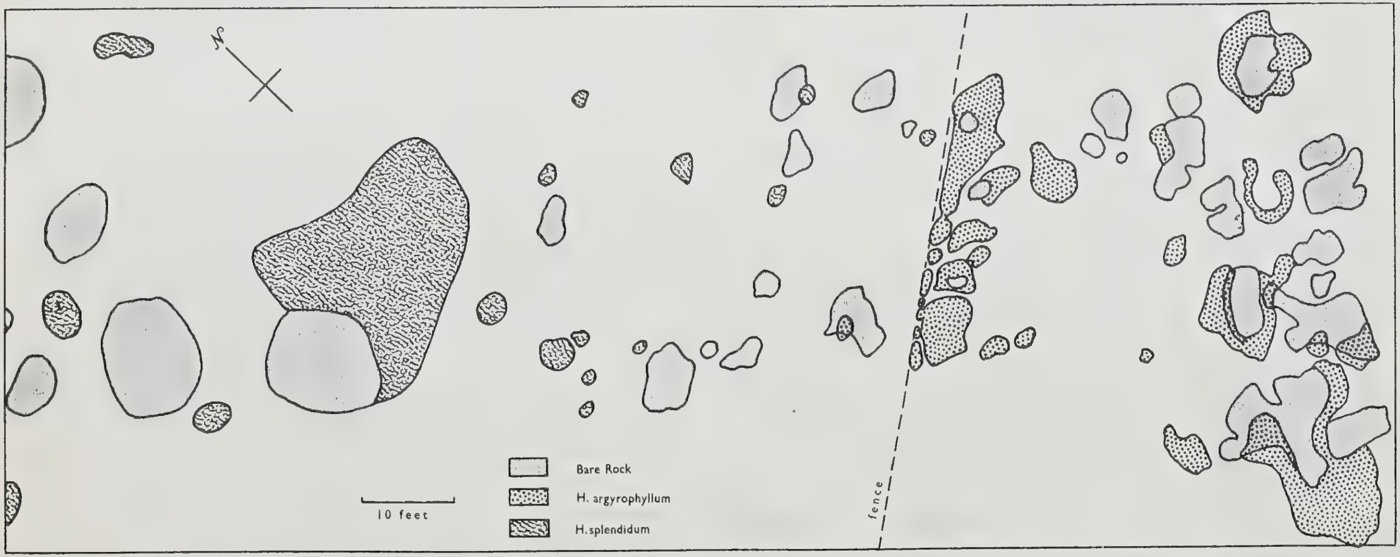
Table showing the distribution of *Helichrysum* species on Tor Doone, in terms of frequency, density and basal cover.

		Frequency		Density		Basal Cover	
		% frequency	x^2 for mean difference	% density per ¼ sq. m.	t. for mean difference	% cover per 1,000 points	t. for mean difference
H. adenocarpum ..	Grazed ..	9	1·15	0·22	1·65	0·23	3·24″
	Ungrazed	5		0·06		0·02	
H. adscendens ..	Grazed ..	14	0·04	0·34	0·27	0·21	1·07
	Ungrazed	13		0·30		0·11	
H. argyrophyllum ..	Grazed ..	9	4·34′	0·30	2·14′	0·15	1·66
	Ungrazed	2		0·05		0·03	
H. glomeratum ..	Grazed ..	12	1·39	0·38	1·54	0·07	1·89
	Ungrazed	7		0·15		0·18	
H. miconiaefolium ..	Grazed ..	20	14·13‴	0·45	2·57′	0·22	3·31″
	Ungrazed	45		1·04		0·46	
H. odoratissimum ..	Grazed ..	53	23·63‴	1·55	3·96‴	0·70	3·45‴
	Ungrazed	19		0·39		0·28	
H. splendidum ..	Grazed ..	8	5·16′	0·11	6·00‴	0·11	1·36
	Ungrazed	1		0·02		0·04	

Levels of significance indicated thus: ′=0·05, ″=0·01, ‴=0·001.

the grazed and ungrazed areas it can be seen that the same general trends are followed as those of the estimates of frequency. *H. argyrophyllum H. odoratissimum* and *H. splendidum* are denser in the grazed area whereas *H. miconiaefolium* is more dense in the ungrazed area. Using a modified t. test (Snedecor 1956, p. 97) the differences in densities of *H. adenocarpum, H. adscendens* and *H. glomeratum* in the two areas do not attain significance at the 0.05 level.

Basal cover was estimated by the point analysis method. Recordings were made of rooted plants at a thousand points in each area, the points being in two hundred randomly placed groups. From the table it can be seen that the measurements of basal cover also indicate that some species are depressed by grazing, others flourish and some are little affected. The significance of the differences of the means has been determined by an application of the t. test in which account is taken of the non-randomness of the groups of ten linked points (Greig-Smith 1957, p. 44). *H. adenocarpum* and *H. odoratissimum* both show a significantly greater cover in the grazed than in the ungrazed area, whereas the opposite is



Map showing the distribution of the clumps and large plants of H. argyrophyllum and H. splendidum near the summit of Tor Doone.

the case with *H. miconiaefolium.* It is interesting to compare the figures for basal cover with the mapped distribution of *H. argyrophyllum* and *H. splendidum.* The map shows the occurrence of large plants or clumps of plants, small individuals not being recorded. On a basis of point analysis, basal cover below 0.05% is therefore not included and the picture is thus of the almost complete absence of *H. argyrophyllum* in the ungrazed area and the complete absence of *H. splendidum* in the grazed area. Even at this level of accuracy the ground cover of *H. argyrophyllum* is over 14% of the grazed and that of *H. splendidum* 7% of the ungrazed area. However the estimates of basal cover for these two species do not attain significance, demonstrating in a striking fashion the effect of mat formation. In the case of *H. argyrophyllum* there is a strong tendency for the patches to be associated with outcrops of rocks and a proportion of the ground covered is therefore bare rock overgrown by mats of *Helichrysum.* This rock is in the form of flattened domes, making a gentle angle with the soil surface. The rocks are therefore surrounded by a belt of very shallow soil which is easily dried out and also subject to considerable heating by the underlying rock. In situations of this kind *H. argyrophyllum* is at a competitive advantage.

Both *H. argyrophyllum* and *H. odoratissimum* are listed by Acocks (1953, p. 156) as "undesirable plants which should be reduced in number by appropriate veld management." Whereas it is true that both of these are indicative of degenerate pasture, and are of no nutritive value, they are not directly harmful, and in the case of *H. argyrophyllum* at least, do protect the soil from further damage (Schonland 1927).

ACKNOWLEDGMENTS

The author wishes to acknowledge the assistance of the students of the Department of Botany of Rhodes University who carried the equipment to the top of the mountain and who helped in the survey. Thanks are also due to Dr. A. R. Loveless for his helpful criticisms.

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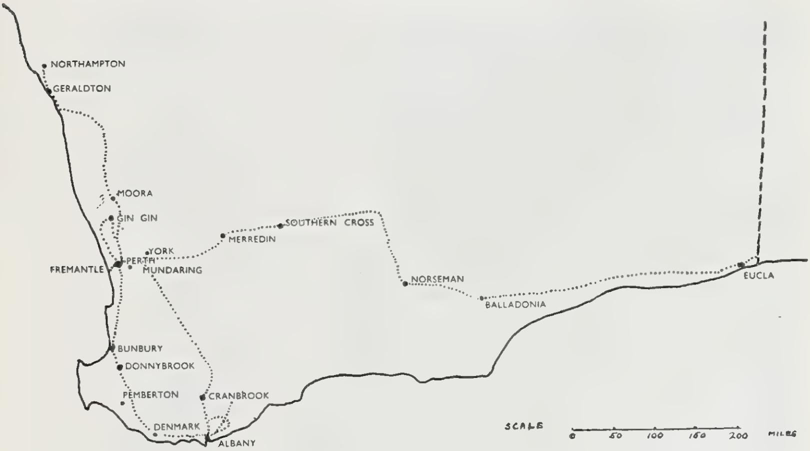
SOME IMPRESSIONS OF A SOUTH AFRICAN BOTANIST IN TEMPERATE WESTERN AUSTRALIA

By Margaret R. Levyns.

(With Plates XV and XVI.)

A botanist familiar with the Cape Flora in South Africa cannot fail to be interested in the unique but comparable flora of Western Australia. There families such as Proteaceae, Restionaceae, Thymelaeaceae and Rutaceae, uncommon or missing from most parts of the world, constitute important elements of the flora just as they do in South Africa. However, the abundance of other families such as Myrtaceae, Goodeniaceae, Pittosporaceae, Dilleniaceae, Tremandraceae etc., rare or absent in South Africa, makes it clear that the relationship is remote.

During the spring and early summer months of 1959, the writer, who has lived most of her life in contact with the Cape Flora in South Africa, had an opportunity of seeing the West Australian counterpart. Headquarters were made at Perth and journeys north, south and east were made so as to gain a general impression of the vegetation at once so similar to and yet very different from the South African. The routes followed are shown on the accompanying map.



Map.

Southern part of Western Australia.

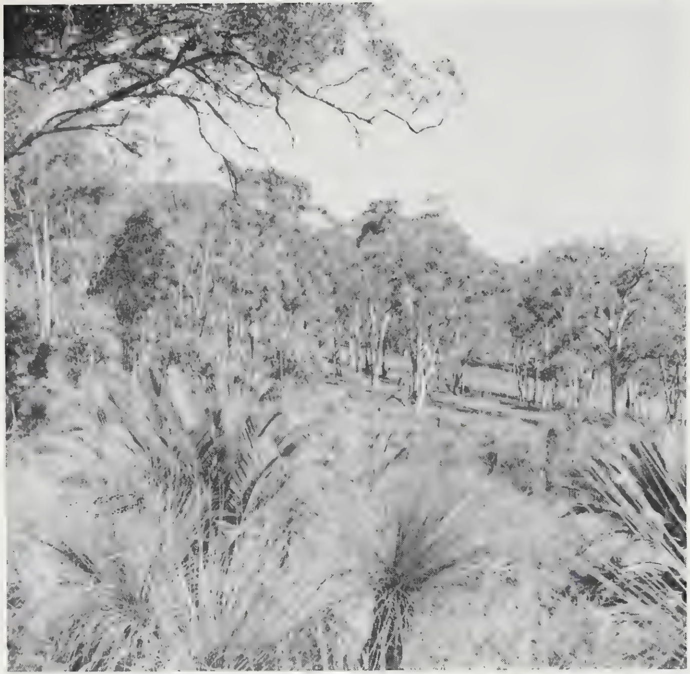
The main routes travelled are shown as dotted lines.

The climate of the south western corner of Australia is similar to that of the south western Cape Province. The rain falls mainly during the winter months and the summer is dry and hot. In the accompanying table the rainfall figures for selected localities are given. These are adapted from the tables given in Gardner's account of the vegetation of Western Australia[1]. It will be noticed that among the stations given the one with the highest rainfall is Pemberton, in the heart of the Karri forest in the south western corner. The annual rainfall diminishes both northwards and eastwards from this region. In the south the rainfall is more evenly distributed throughout the year though in every case more rain falls during the winter than in the summer. High ground is conspicuously lacking in Western Australia but wherever a moderate elevation exists, it has a marked effect on the rainfall. A comparison of the figures given in the table between those of Perth on the coastal plain and those of Mundaring in the Darling Range less than twenty miles distant, brings this out clearly. The Darling Range has an altitude with an average of about a thousand feet, yet its valleys are capable of supplying reservoirs with water not only for Perth but also for the towns on the goldfields over three hundred miles away.

	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Northampton(60)	·23	·42	·45	·79	2·61	4·53	4·15	3·24	1·84	·97	·35	·22	19·09
Perth (66) ..	·33	·40	·81	1·71	5·05	7·09	6·72	5·71	3·36	2·19	·76	·54	34·67
Mundaring (36)	·36	·67	1·01	2·04	5·74	8·18	8·95	7·19	4·73	3·07	·93	·65	43·52
Donnybrook (41)	·45	·63	1·11	1·76	5·69	7·68	7·76	6·08	4·63	2·98	1·16	·61	40·54
Pemberton (6) ..	1·60	·57	1·77	2·95	6·99	7·87	8·10	8·88	4·93	4·22	2·19	1·05	51·11
Denmark (40) ..	1·26	1·35	2·17	3·23	5·70	6·73	7·28	6·46	5·04	4·29	1·81	1·40	46·72
Albany (65) ..	1·01	·88	1·59	2·75	5·02	5·43	5·59	5·30	4·08	3·24	1·46	1·15	37·50
Merredin (38) ..	·40	·46	·92	·94	1·54	2·03	2·13	1·56	1·04	·89	·44	·57	12·92
Norseman (45) ..	·55	·71	·89	·96	1·17	1·14	·96	1·11	·72	·92	·82	·72	10·67
Balladonia (51)	·48	·51	·99	·70	·99	·93	·72	·91	·68	·97	·76	·67	9·31

Rainfall figures in inches. The number of years during which records have been kept, is given in brackets after each place name.

Though the rainfall is comparable with that of the western Cape Province, the topography of Western Australia is strikingly different. A visitor arriving in Perth from Fremantle will see what appears to be a range of low hills in the distance. Known as the Darling Range, this is not a true mountain but an escarpment and is the present western border of the old land of Yilgarnia, a land which has existed almost since the dawn of geological time[3]. At one time Yilgarnia must have had lofty mountain ranges with glaciers or rivers flowing in the valleys, but



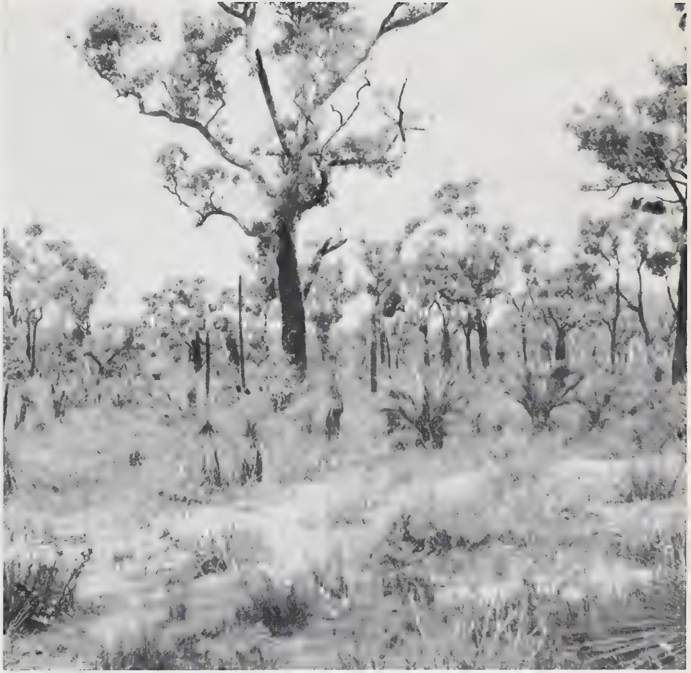


PLATE XV.

FIG. 1.—Typical woodland scene in the National Park in the Darling Range near Perth. The trees are species of Eucalyptus. Blackboys and Cycads are in the foreground.

FIG. 2.—A more open type of woodland than that shown in photograph 1, on the Geraldton road about twenty miles north of Perth. Some of the Blackboys have young inflorescences. The small shrubs in flower belong mostly to the genus Hibbertia.

erosion in the course of ages, has worn away the mountains till today a flat landscape, with here and there a few low undulations, is all that is left. Not even rivers remain though it is generally assumed that the numerous salt lakes, dry except after very heavy rains, are relics of old river systems. No volcanic activity has disturbed its ancient peace though in the southern and eastern parts of Australia volcanicity has played its part until relatively recent times.

From the Darling Range to the Nullarbor Plain in the east the surface of the old land of Yilgarnia slopes down gradually till finally its granites and gneisses disappear below the limestones that cover much of the Nullarbor Plain. To the west of the Darling Range is a somewhat narrow coastal plain composed of much younger rocks. In the south the Darling Range peters out and the old land surface slopes down towards the sea which during the Tertiary epoch invaded this part of the area. The only mountains worthy of the name in the southern part of Western Australia occur a little north of Albany and are known as the Stirling Range. It extends from west to east for about forty miles and for most of the distance is considerably lower than Table Mountain though its highest peak, Bluff Knoll, is about one hundred feet higher. This and the much lower Porongorup Range to the south, are isolated mountains and there is nothing in Western Australia comparable with the continuous mountain chains of southern Africa.

Mountains introduce a range of climates into quite a small area. Sheltered valleys permit the continued development of mesophytic plant communities which would have no hope of survival in flat unbroken country with a mediterranean type of climate such as both South Africa and Australia possess. The mountain ranges of southern Africa antedate the period during which the Angiosperms evolved and it is evident that the mountains must be significant in the history of the floras now covering the land. Western Australia is wholly lacking in mountains which might in the past have provided sanctuary for older floras which once occupied the land. The striking uniformity in its vegetation is almost certainly correlated with the absence of mountains.

A visitor arriving at Perth in the spring is immediately overwhelmed by the variety of plants in flower. The introduction to the flora is made easy by the presence of a nature reserve, King's Park, just on the outskirts of the business part of the city. Here the natural vegetation is preserved and it says much for the civic pride of the inhabitants of Perth that even a striking plant such as the Kangaroo Paw (*Anigozanthos manglesii*) is allowed to grow unmolested along the public roads and paths within the park.

The task of getting to know the flora is simplified by a most useful handbook to the flora[2] where the excellent coloured plates give the botanist as well as the layman much needed help. King's Park may be taken as a typical example of the vegetation of Western Australia in parts with a moderate rainfall. At first sight the vegetation appears completely different from that of South Africa. In open country in the region of winter rainfall in South Africa, trees are a rarity. Such things as the Silver Tree near Cape Town and the Clanwilliam Cedar further north are exceptional and low bush is the rule. It would be difficult to think of any place outside forests in South Africa where one could get lost because of an inability to see far ahead. This is not so in Australia where the tree form is common and distant views are rarely possible unless the trees have been felled or burnt. Getting lost in the Australian bush is by no means a figment of the imagination. It is a real danger once one gets away from the towns.

Nowhere in Australia except in the driest parts and in moist tropical forest can one ignore the ubiquitous genus Eucalyptus. Throughout most of the continent it dominates the landscape, either in the tree form as in King's Park or in the shrubby mallee form in the drier parts. The term mallee is one in common use in Australia and denotes a growth form in which a number of equivalent stems arise from the underground parts instead of the solitary main stem as in a tree. There is no sharp boundary between the two growth forms but in general, mallee is a useful term for the plant ecologist. One of the most vivid impressions of the Australian scene is the amazing diversity in form and behaviour of the family Myrtaceae. Eucalyptus is the largest genus, with Melaleuca (Tea trees) coming second. In addition there are thirty-one other genera in Western Australia, many of them common. In size they range from forest giants to small undershrubs. Many have brilliantly coloured flowers, blue being the only colour not represented. Botanists used to seeing members of the Myrtaceae in cultivation in other lands assume that the family is easily recognised. In Western Australia they are soon disillusioned for *Actinodium cunninghamii* has the appearance of a member of Compositae while *Darwinia vestita* looks so much like a species of Agathosma that it was assumed by the writer that it belonged to Rutaceae until close examination proved otherwise. In the Cape Flora the family Myrtaceae is represented by one species only, *Metrosideros angustifolia*, a streamside plant. The genus does not occur in Western Australia and is best developed in New Zealand and the Pacific Islands. It is apparent that an outstanding difference between the floras of Western Australia and the south western Cape Province is the dominance of this particular family in the one and its extreme paucity in the other. The impression of dissimilarity of the two floras is heightened by some conspicuous common plants such as the Blackboy (*Xanthorrhoea preissii*) and a Cycad (*Macrozamia reidlei*). Several species of Casuarina play their part in making the flora look so unlike that of any other part of the world. If the Eucalypts and these other unusual plants be banished from one's mind, then the undergrowth is not unlike the Cape sclerophyll though the plants comprising it are mainly different. Many of the families are familiar. The family Leguminosae is well represented and the brilliant colour of its flowers is one of the striking features of an Australian Spring. A link between South Africa and Australia is the Tribe Podalyrieae, best developed in Australia which has about thirty genera. In South Africa there are two common genera, Podalyria and Cyclopia. In the sub-family Mimosoideae the numerous species of Acacia are prominent in the Australian scene. In South Africa only one native species, *Acacia karroo*, reaches the region of the Cape Flora though the genus is common in other parts of Africa. It is more likely that *Acacia karroo* is an invader into the Cape area than an integral part of the Cape Flora. Several species of Acacia which have been introduced into the Cape region from Australia have established themselves so firmly that in places the Australian element dominates the scene. The problem raised by foreign invaders in both countries will be discussed later for in Australia some South African plants behave in much the same way as Australian plants in South Africa.

The family Proteaceae occupies a similar position in both countries, the plants being both conspicuous and colourful. The flowers show a much wider range of structure in Australia and some genera such as Conospermum and Stirlingia do not at first sight suggest Proteaceae to a South African botanist. A difference which brings itself home forcibly to the field botanist in Australia is the spiny nature of the leaves in so many of the species. In South Africa though the leaves are leathery they are never spiny and one can push one's way without laceration through any type of native proteaceous scrub. The tendency to spininess in West Australian plants appears not only in the Proteaceae but in other families as well and is one of the striking differences between the two floras. In Australia one would never approach species of Hakea, Grevillea, Acacia or Daviesia, to mention just a few genera, without ascertaining whether or not it is safe to do so.

Two families well represented in both countries are Thymelaeaceae and Rutaceae. Pimelea, belonging to the former family, has many species and bears a superficial resemblance to the South African genus Gnidia. Among the Rutaceae the resemblance is not usually very striking for in Australia the genera belong to the tribe Boronieae while the African genera belong to the Diosmeae. Nevertheless *Crowea dentata* has much the appearance of *Agathosma betulina*, the buchu of commerce.

The small family Byblidaceae is confined to the two countries, Byblis in Australia and Roridula in South Africa.

The austral family Restionaceae affords another link though in this case the family is much better developed in South Africa. In Australia there are relatively few species and only in rare instances do they dominate the scene. In South Africa the species are numerous, a recent estimate giving a total of 282 species of which 109 belong to the genus Restio. In many cases the species grow socially and form a conspicuous part of the vegetation. It would be impossible for even an indifferent observer to overlook the family in South Africa whereas this could be done easily in Australia.

Compositae is another family which is much more abundantly developed in South Africa. The shrubby members which occur in large numbers in the Cape area, are rare in Australia where herbaceous forms abound. The genera Helichrysum and Helipterum which are common to both countries, show this difference of habit clearly.

In addition to the genera already mentioned there are several others, not of world wide occurrence, which appear in both floras. The following list will serve to illustrate these generic links:— Chrysithrix, Tetraria, Wurmbea, Bulbine, Caesia, Dodonaea, Carpobrotus, Pelargonium, Zygophyllum, Cassytha, Wahlenbergia.

Though the similarities in floral relationships between the two countries are striking, the dissimilarities are equally so. The family Myrtaceae, the hall mark of the Australian scene, has been mentioned. Other characteristic families which are absent or almost so from South Africa are:— Casuarinaceae, Goodeniaceae, Stylidiaceae, Pittosporaceae, Stackhousiaceae, Epacridaceae, Tremandraceae, Dilleniaceae and Cephalotaceae. The Goodeniaceae with their often brilliantly coloured blue, red or yellow flowers, are among the most spectacular of the spring flowering plants. A memorable sight is a roadside bordered with a blue ribbon of *Leschenaultia biloba* and species of Dampiera. The predominance of blue flowers, a remarkable feature of the flora of Western Australia, is well brought out by this family. The only member of Goodeniaceae in South Africa is the rather drab *Scaevola thunbergii* which is common on the sea shore from Mossel Bay eastwards. The genus Hibbertia, belonging to Dilleniaceae, of which South Africa has no representative, is extremely common in the less arid parts of the south west. The yellow flowers of this genus are usually to be seen forming part of the colourful carpet between the Eucalyptus trees. The family Epacridaceae is closely related to the more widely spread Ericaceae, conspicuous in the South African flora. Though the Epacridaceae are frequently called heaths in Australia, they seldom have the aspect of a true heath. Apart from the genus Leucopogon which is widespread and common, they are rather local in their distribution and only assume importance in the south, in places with a high rainfall. Round about Albany members of the family are abundant.

There are two endemic families only in Western Australia, Tremandraceae and Cephalotaceae. Both families are small and together contain about fifteen species. In South Africa there are four such families, Penaeaceae, Geissolomataceae, Bruniaceae and Grubbiaceae. The number of species belonging to these families is about one hundred. Endemic families play a more important part in the Cape Flora than they do in that of Western Australia.

A considerable number of aliens are established in Western Australia and plants from South Africa form a considerable proportion of them. How and when these South African immigrants arrived is not clear but some have obviously been in Australia for a considerable period and are completely established. For example the coastal sands north and south of Fremantle have so many Cape plants that at times it was difficult to remember that one was not in South Africa. *Carpobrotus edulis* is common and is known in Australia as Pig-face. *Anthericum divaricatum* is locally abundant. Others frequently encountered are *Pelargonium capitatum*, *Tetragonia decumbens* and *Heliophila pusilla*. In Perth there is a legend that the seeds of these coastal plants reached Australia in sand brought from Table Bay as ballast in vessels trading between the two countries. The traffic must have been in one direction only for South Africa has none of these accidental introductions. The Australian plants in South Africa were introduced deliberately by man. Further inland other South African plants are encountered. One of the most widely distributed of these is *Arctotheca calendula*, known in Australia as the Cape Weed. This species has spread all over Temperate Australia but exhibits its greatest vigour in Western Australia. In land cleared for farming it often takes possession and provides attractive splashes of colour during the spring. It has some food value for stock and for that reason is accepted as a welcome addition to the indigenous flora. This is far from being the case with *Homeria breyniana* which has also spread rapidly. Its aggressive habit and poisonous nature make it a most unwelcome intruder. It seems unlikely that this much disliked plant was in the first instance introduced as a garden plant for it is as unpopular in the land of its origin as it is in Australia, but many other members of Iridaceae appear to have started their migrations from gardens. Species of Watsonia, Gladiolus, Freesia, Babiana, Sparaxis and others probably gained an entry in this way but now are so firmly established that it is difficult to think of them as aliens. *Ehrharta calycina*, known in Australia as Veld Grass, has become somewhat aggressive in the neighbourhood of Perth. In South Africa though widespread it is rarely social in its behaviour and does not attain the size it does in Australia.

The following list of South African plants established in Western Australia was compiled during the author's stay of a little over six weeks. It makes no claim to be regarded as a comprehensive list of naturalised South African plants but it will give some idea of the large South African element which has made itself at home in Australia.

Gramineae	*Ehrharta calycina* Sm.
Iridaceae	*Babiana stricta* (Ait.) Ker.
	Ferraria undulata L.
	Freesia refracta Klatt
	Geissorhiza spp.
	Gladiolus caryophyllaceus Poir.
	Homeria breyniana (L.) Lewis
	Ixia maculata L.
	Ixia spp.
	Romulea rosea Eckl.
	Sparaxis grandiflora Ker.
	Watsonia pyramidata (Andr.) Stapf
	Watsonia spp.
Liliaceae	*Anthericum divaricatum*
Araceae	*Zantedeschia aethiopica* (L.) Spreng.
Cruciferae	*Heliophila pusilla* L.f.
Aizoaceae	*Carpobrotus edulis* (L.) N.E. Br.
	Tetragonia decumbens Mill.
Geraniaceae	*Pelargonium capitatum* (L.) Ait.
Solanaceae	*Solanum sodomaeum* L.
Compositae	*Arctotheca calendula* (L.) Levyns
	Arctotheca nivea (L.f.) Lewin
	Osteospermum clandestinum T. Norl.
	Ursinia anthemoides (L.) Gaertn.

In most cases the plants enumerated above are identical in their homeland and in the country of their adoption. In a few cases, however, there are slight changes. This has already been noted for *Ehrharta calycina* which in Australia grows more vigorously, is taller and has adopted a social habit. The same vigour was noted in *Gladiolus caryophyllaceus* which frequently attains a height of two feet. In its homeland this handsome species which is usually smaller, is fast disappearing due to cultivation of the veld and other activities of man. *Sparaxis grandiflora* which is variable in South Africa is represented in Australia by a rather small form. *Osteospermum clandestinum*, a common species in South Africa, usually has pale yellow ray florets whereas in Australia the rays have a reddish tinge. *Arctotheca nivea* which is a handsome sea shore plant in South Africa is common round about Albany in similar situations.

However, in the Australian form the ray florets are short and the flower heads are not showy.

Gardner[1] on p. xxvii refers to alien weeds in Western Australia as having "in the main, proved quite ineffective as a permanent invading force when subjected to competition under natural conditions". In general the writer is able to confirm this statement though *Ehrharta calycina* and some of the Iridaceae appear to be capable of invading natural vegetation and inducing some modification of the undergrowth. However, all the South African intruders are small plants and it seems unlikely that they are capable of bringing about profound changes in a country where large trees and shrubs dominate the scene. The case in South Africa is very different for the invading plants are larger than the indigenous bush. For example several phyllode-bearing species of Acacia were introduced many years ago to assist in controlling drift sands on the Cape Flats near Cape Town. They did their work well but as a result the native plants of that region have been all but eliminated and the Australian victors have taken possession. Since that day the invaders have succeeded in spreading over various parts of the Cape Province and they defy efforts to restrain their exuberance. Several species of Hakea have behaved in a similar fashion but in this case they were probably imported as garden plants. Before long they escaped from cultivation and invaded the veld. To-day, despite the fact that the aggressive species have been proclaimed noxious weeds, they resist all too firmly attempts to eradicate them. The species of Acacia and Hakea, so aggressive in South Africa, behave as peaceful constituents of plant communities in Australia. Evidently in their homeland factors are at work which restrain these plants from behaving as they do in South Africa.

Strangely enough various species of Eucalyptus which grow well in South Africa, have not shown much tendency to spread from plantations and invade natural vegetation.

A feature of the vegetation of southern Western Australia that impresses a botanist from South Africa is its remarkable floristic uniformity. The genus Eucalyptus is omnipresent and it is mainly this genus that characterises the different plant associations. The species vary both with rainfall and with differences in the soil. In the drier parts the trees are smaller, are more widely separated and may assume the mallee form, whereas in the more favoured localities trees become taller until ultimately they form true forest. From Donnybrook southwards, on soil derived from laterite, there are Jarrah forests (*Eucalyptus marginata*). With a still higher rainfall and in areas where the soils are derived from granite or gneiss, the Karri (*Eucalyptus diversicolor*) forms impressive forests. The tall straight trees with their pale smooth bark are an unforgettable sight. So too is the rich and varied undergrowth of these forests. It is in fact a type of temperate rain forest. In South Africa where such forests exist, as at Knysna and in sheltered ravines, they are floristically entirely different from the Cape Flora of the open slopes and plains. The common genera in such forests are Podocarpus, Olea, Curtisia, Ocotea etc., genera which play no part at all in the composition of the Cape Flora. In South Africa these forests may be relics of an old flora which has been able to survive because of favourable refuges provided by sheltered mountain slopes and ravines. In Western Australia where mountain chains are wholly lacking, an old forest flora would have had little chance of survival during periods of unfavourable climate. It is probably significant that in Western Australia fossil pollen grains of the genus Nothofagus, the Southern Beech, have been discovered. To-day that interesting genus with its typically southern distribution, in cold temperate regions, does not occur in Western Australia though it is still to be found in Tasmania and in scattered places in the eastern states. However, the knowledge that it was once a widespread constituent of a post-Cretaceous Australian flora, provides food for thought. Possibly the curious shrubby species of Podocarpus (*P. drouyniana*) which occurs in the undergrowth of the denser forests in the south west is a survival of a flora most of which has disappeared.

The comparison which has been made between the vegetation of the two countries has dealt exclusively with a sclerophyllous type adapted to regions with winter rains and summer drought, regions where the average rainfall does not go below about ten inches a year. Where the rainfall is lower the differences between the two countries are accentuated. In South Africa where the Cape Flora lies adjacent to the Karoo, there is a sudden change from one type of vegetation to another once the critical rainfall figure is reached. The flora of the Karroo bears no floristic relationship to the Cape Flora and is composed largely of succulents. In Western Australia the change from one flora to another is gradual. The size of the trees of Eucalyptus and Acacia diminishes and the numbers also decrease. Finally trees disappear altogether and non-succulent salt-bush which in the drier parts is a constitutent of the plant life between the trees, covers the ground in a fairly close association. The density of the plant cover on the Nullarbor Plain where it is traversed by the Eyre Highway, came as a surprise to one used to the South African Karroo where, except in very sheltered kloofs, the succulent bushes are scattered with much bare earth visible between them.

In all places with a Mediterranean type of climate the aspect of the vegetation is similar but that does not necessarily mean that the taxono-

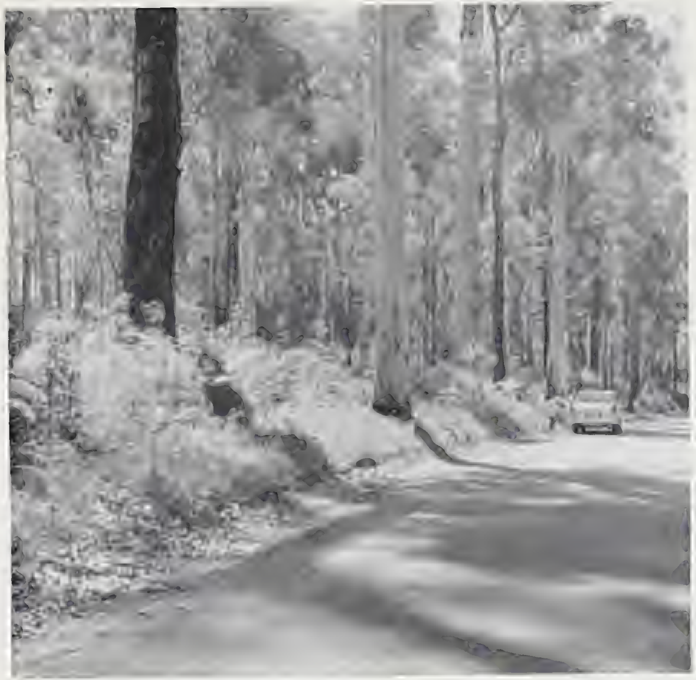


Fig. 1.—In the Karri forest near Pemberton. The Karri trees (*Eucalyptus diversicolor*) may be recognised by their pale, smooth bark.

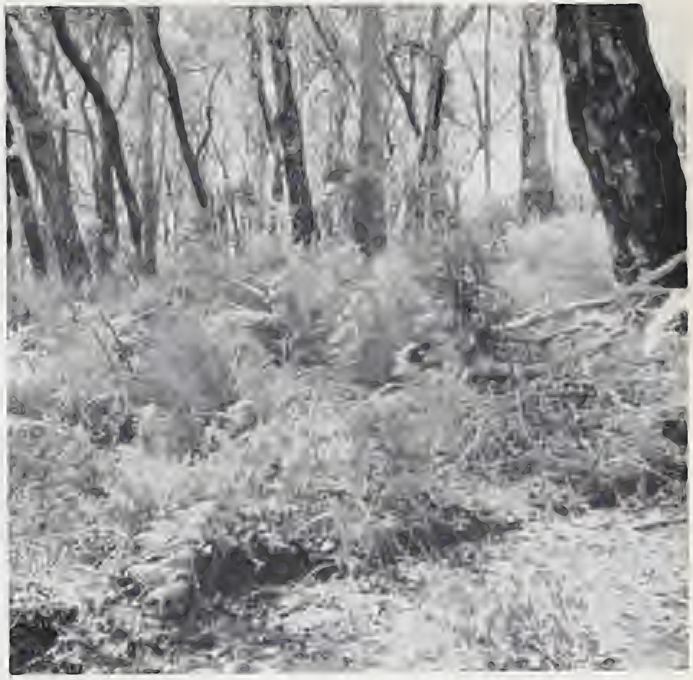


Fig. 2.—Scene in the Jarrah forest near Donnybrook. Dense undergrowth occurs under the trees.

Plate XVI.

mic elements comprising the floras show affinities. For example in Provence in the south of France the general appearance of the vegetation is much like that of the Cape region in South Africa, but the elements which make it up are entirely different. The Cape region and Provence and the Cape region and Western Australia are widely separated geographically, yet in the first case there is no floral affinity and in the second the affinity is pronounced if remote. The taxonomic relationship between the floras of South Africa and Western Australia suggest that in the past both countries derived some of their floral elements from a common source. Botanists are by no means agreed as to the whereabouts of that common source. Some place it near Antarctica while others urge that a northern origin is more in accordance with the facts of present day plant distribution. The trouble with all the theories of plant migrations in the Southern Hemisphere is that they are based on inadequate evidence. New hope of settling some of these problems comes from the young and flourishing science of palynology. Hitherto many of South Africa's Cretaceous and post-Cretaceous plant fossils have proved to be too fragmentary to be of great value. Now that it is known that plants may be recognised with a considerable degree of certainty from their fossilised pollen grains there is new hope of obtaining information about the past floras of South Africa. The development of special methods for extracting pollen grains from a stony matrix has led to advances in our knowledge of past floras of the circumpolar regions of the south. In Western Australia work is in progress along these lines and it is hoped that before long South Africa will fall into line with the other lands of the Southern Hemisphere and add her contribution to the ever-unfolding story of the past. Perhaps the hope expressed by the late Field Marshal Smuts in his Presidential Address to the South African Association for the Advancement of Science in 1925 that palaeobotany would succeed in solving the mystery of the origins and movements of the southern floras, will soon be on the way to realisation.

Acknowledgments

My thanks are due to Professor J. M. Grieve of the University of Western Australia for granting me permission to work in the Department of Botany during my stay in Perth. I also wish to record my appreciation of the assistance given me by Miss Alison Baird and other members of the staff.

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THE UNITY OF THE GRASS STOOL IN ERAGROSTIS CURVULA

By J. H. Leigh

(Botany Department, University of Witwatersrand)

Eragrostis curvula is a perennial bunch grass widely used as a ley grass in certain areas of South Africa. During the spring of 1959 a marked difference was observed in the production of shoots between various plants. All plants had been cut to within a few inches of the ground three months earlier, and were growing at varying distances from one another in an experiment designed to study the effects of espacement. The area between plants had been kept free of weeds and varied from 9 inches to 6 feet. Only those plants growing 3 feet, 4½ feet and 6 feet apart showed growth, and this was limited to the North-East side of each plant only.

As a result of these observations, an investigation of the connections between one part of a grass stool and another was made. In adult plants the crown is composed of a large number of rooted, vegetative shoots that may be easily separated. Usually roots appear within a few weeks after the shoots have been produced. Separated parts, transplanted under favourable conditions, start new growth quickly. In the stool rooted shoots are linked together by short stolons which in older plants are heavily suberized, and apparently non-functional. The question arose therefore whether the portions of a mature grass stool were perhaps independent of each other, being only mechanically connected. In young plants on the other hand, the connecting stolons have a healthy appearance, and may be functional.

Six-week and two-year-old plants of *Eragrostis curvula* (Robusta blue strain) were transplanted into glass jars containing Miltner's nutrient solution. The plants were allowed sufficient time to recover from this treatment.

One portion of each plant was enclosed in a 1 litre flask in which radio-active carbon dioxide was liberated from $BaC^{14}O_3$. The leaves were exposed to a dosage of 77.5 mc. The plants were left in the flask for thirty hours (18 hours bright sunshine, 12 hours dark). At the end of this period, before removing the plants, all leaves outside the flask were cut as near to the crown as possible, and air-dried. The plants were then allowed to re-shoot, and after two weeks they were pressed and air-dried.

Survey autoradiographs of the dried material were made by mounting specimens on cardboard, and placing them in contact with plates of

Kodirex X-ray film in a light-proof casette. Counts of the radio-active material were also measured.

It was possible to demonstrate radio-activity in the leaves outside the assimilation chamber. The activity in the ground air-dry material from the older plant as measured by infinite thickness was much less (av. 10 counts/min./mg., corrected for background), than that found in the corresponding leaves of the younger plant (av. 1,327). Generally the younger the leaves, or the nearer they are to the irradiated part of the plant, the higher the activity.

After two weeks the following counts were obtained for air-dried material of exposed leaves: 2,429 counts/min./mg. (young plants) and 61 counts/min./mg. (old plants). When we assume that the decrease in activity during this period was proportional for both young and old plants, we can conclude that a greater percentage of material was transported in the former. Nevertheless some transport had taken place through the old stolons which therefore were still physiologically active to some extent.

Evidently the grass stool behaves as a unit even at a later stage. It is found, however, that growth can proceed more rapidly in one part than in another.

The work was supported by a grant from the Department of Agriculture, Pretoria, which is gratefully recorded.

DISTRIBUTION STUDIES OF INTRODUCED TREES AND SHRUBS IN THE CAPE PENINSULA

By A. V. Hall

(*Bolus Herbarium, University of Cape Town*)

Introduction

Concern has been expressed in recent years about the rapid spread of certain introduced trees and shrubs in the vegetation of the South-Western Cape. These species were originally introduced for economic purposes, amongst others for the production of timber and the fixing of sand dunes. The introductions have since spread and now appear to be dominant in communities far from where they were originally planted.

It is becoming increasingly evident that these species are spreading to upper mountain slopes, and it has been suggested that they may constitute a distinct menace to the continued existence of the unique indigenous flora now restricted to these parts. The present work is designed to examine the high altitude distribution patterns of introduced species, and to provide a basis for assessing what is likely to happen if the present situation were to remain unchecked.

Methods

The area selected for the survey consists of a 40 square mile tract of mountains in the northern part of the Cape Peninsula, extending from Table Mountain southwards to the Muizenberg Mountains. Throughout the area, intersections of the thousand yard grid lines on the 1 : 25,000 Trigonometrical Survey map of the Cape Peninsula (1951) were taken as sample points for plotting distribution patterns. (See Maps 1—9). Only those points above 500 feet and not lying in forestry plantations were examined. The points were located in the field by means of an altimeter and bearings taken from survey beacons with a prismatic compass.

At each sample site, details were recorded on a duplicated form as follows: position and altitude of site, numerically and physiognomically dominant indigenous species, average cover height and density, post-burn age, soil type, soil moisture, and aspect. Introduced species were recorded in terms of the approximate number of plants within a radius of 200 yards of the sample point. Where high frequencies were encountered, a circular area of 100 sq. meters was examined at the sample site to gain some idea of the densities attained in such communities. In addition, photographs were taken of the vegetation at most of the sample points.

The survey was restricted to those introduced species whose arborescent life-form would be likely to cause important changes in the structure and species-content of the local flora. It was found that thirteen species fell into this category. The survey was carried out in the period May 1959 to May 1960.

Distribution Patterns

Distribution of introduced species is shown in Maps 1—9. The areas enclosed by the circumferences of the filled and unfilled circles are proportional to the number of plants found within 200 yards of the sample points. Numbers of plants above 200 and below 20 are represented by the largest and smallest circles given in the scale.

Of the 87 points examined, only four were found to be free from introduced species. The percentage occurrence of each species at sample points is listed in Table 1.

Table 1.

Percentage occurrence of introduced species at 87 sample points.

Pinus pinaster Ait.	83%
Hakea gibbosa Cav.	24%
Acacia cyclops A. Cunn.	20%
Acacia cyanophylla Lindl.	17%
Pinus radiata Don	11%
Hakea suaveolens R. Br.	11%
Hakea acicularis R. Br.	9%
Albizia distachya (Vent.) McBride	7%
Acacia longifolia Willd.	7%
Acacia melanoxylon R. Br.	6%
Pinus pinea L.	6%
Eucalyptus sp.	5%
Acacia mollissima Willd.	1%

It is apparent from Table 1 that *Pinus pinaster* is very much more widely dispersed than the other species. However, it is evident from Diagram 1 that *P. pinaster* was most commonly found at low to moderately high local frequencies at sample points, and that very high frequencies of this species were uncommon. This is in contrast to *Hakea gibbosa* and *Acacia cyclops*, where very high frequencies were encountered in several places.

Distribution in Relation to Ecology

The maximum development attained by introduced species in various communities and soil types is shown in Table 2. The sclerophyll community is by far the most widespread in the areas examined, and consists chiefly of xeromorphic shrubs with ericoid leaves and reed-like Restionaceae. Moist soils are relatively uncommon, as are soils with a high clay

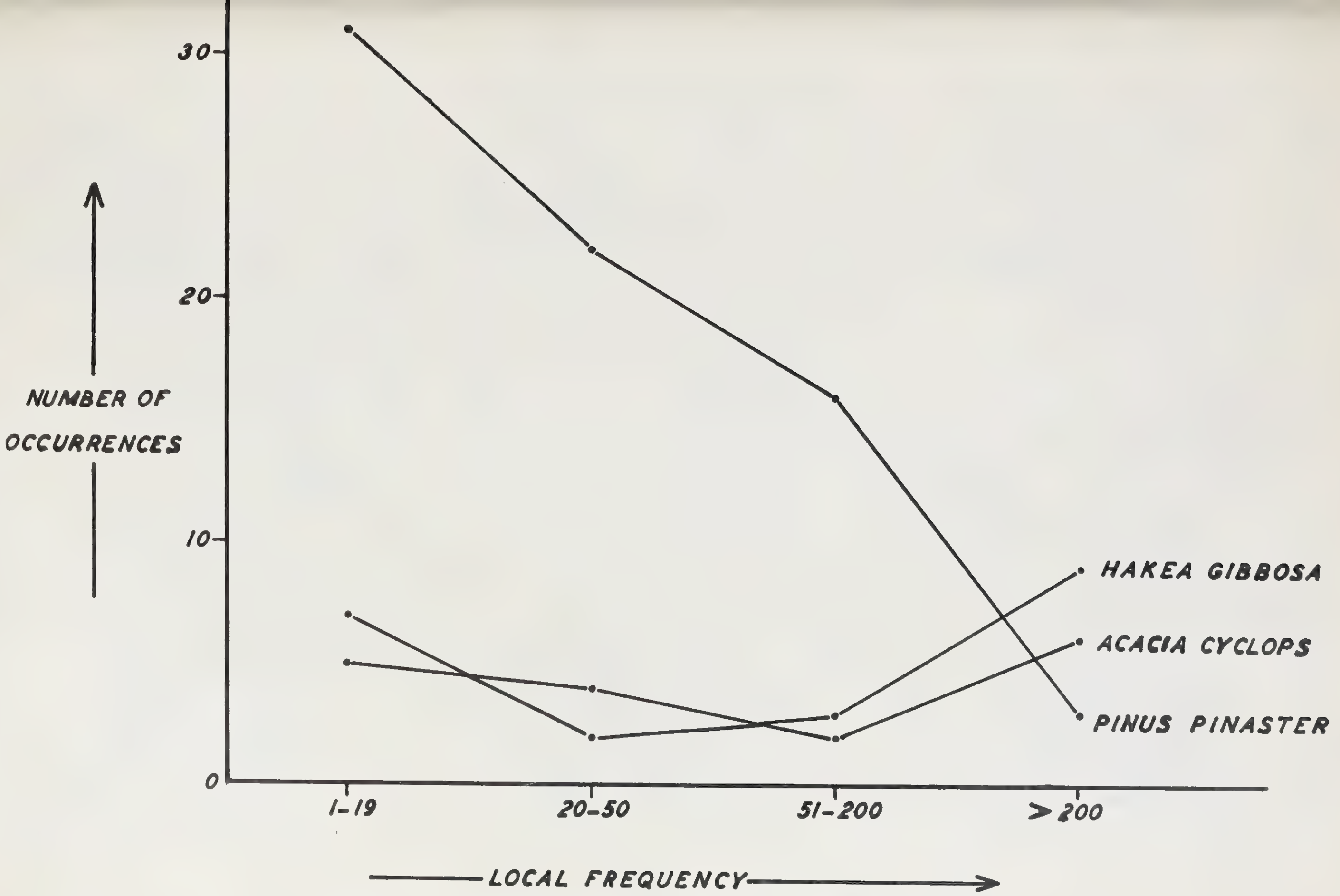


DIAGRAM 1. Graph showing the number of occurrences of various local frequencies of three of the most widespread species. Local frequency is expressed as the number of plants within 200 yards of the sample point.

content and those derived from decomposed granite, both of which are found at low altitudes. Broad-leaved forest, consisting of such species as *Podocarpus latifolius* (Thunb.) R. Br., *Halleria lucida* L., *Rapanea melanophloeos* (L.) Mez., and *Royena lucida* L., is chiefly confined to ravines. The broad-leaved bush community was mostly found on moist talus slopes near cliffs, at forest margins, and in the more exposed ravines. It is characterised by such species as *Pterocelastrus tricuspidatus* (Lam.) Sond., *Osyris compressa* (Berg.) A. DC., *Gymnosporia laurina* (Thunb.) Szysz., *Olea capensis* L., and *Phylica buxifolia* L.

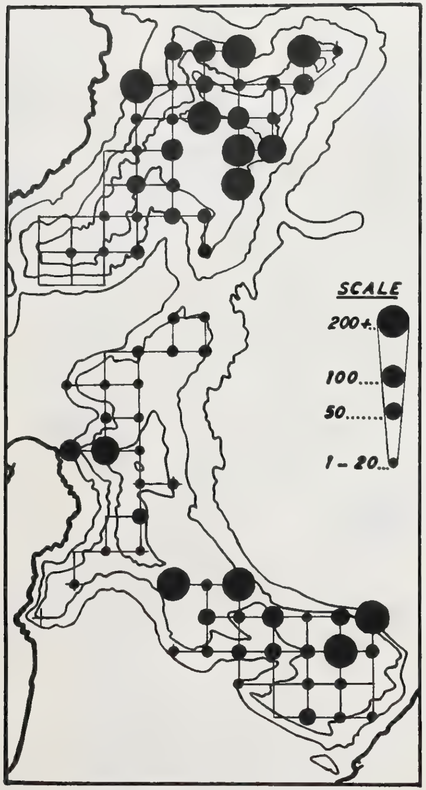
TABLE 2.

Maximum development attained by introduced species in various habitats.
a = abundant, c = common, f = frequent, o = occasional, r = rare

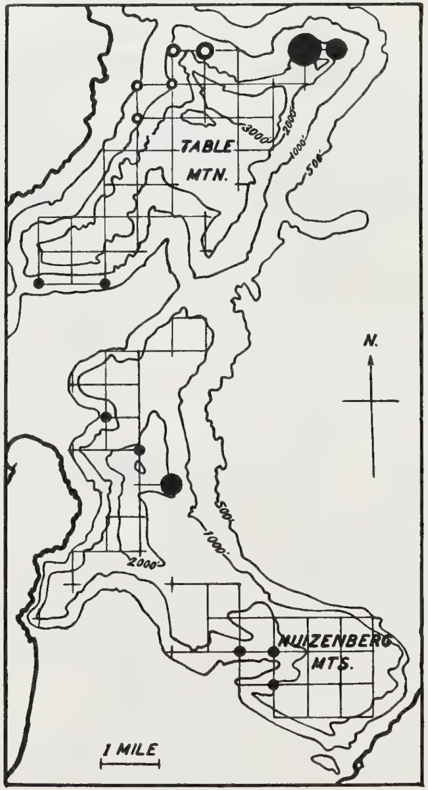
	Pinus pinaster	Hakea gibbosa	Acacia cyclops	Acacia cyanophylla	Pinus radiata	Hakea suaveolens	Hakea acicularis	Albizia distachya	Acacia longifolia	Acacia melanoxylon	Pinus pinea	Eucalyptus sp.	Acacia mollissima
I. SCLEROPHYLL													
(*a*) *Dry slopes:*													
Sandy soils	a	a	a	a	f	a	a	–	o	r	o	r	r
Clay soils	f	–	a	r	–	f	–	–	–	–	–	r	–
Granitic soils ..	f	a	r	r	–	a	–	–	–	–	r	–	–
(*b*) *Moist slopes:*													
Sandy soils	a	r	–	o	c	r	–	–	–	c	–	c	–
Clay soils	o	r	a	o	r	o	r	a	r	o	–	–	–
Granitic soils ..	o	r	o	–	–	–	–	a	–	–	o	–	–
(*c*) *Cliffs and rocky places with shallow soil* ..	c	–	–	o	r	–	–	–	f	r	–	–	–
II*a* BROAD-LEAVED FOREST ..	r	–	–	–	–	–	–	–	–	–	–	–	–
II*b* BROAD-LEAVED BUSH ..	o	–	–	a	r	–	a	o	r	r	r	o	–

It can be seen from Table 2 that *Pinus pinaster* occurred in all communities examined, although it was rare in broad-leaved forest. No other introduced species were recorded in this last community. The majority of introduced species were found to form significantly dense colonies on dry slopes in sclerophyll, an exception being *Albizia distachya*, which appeared to develop only on moist clay and granitic soils.

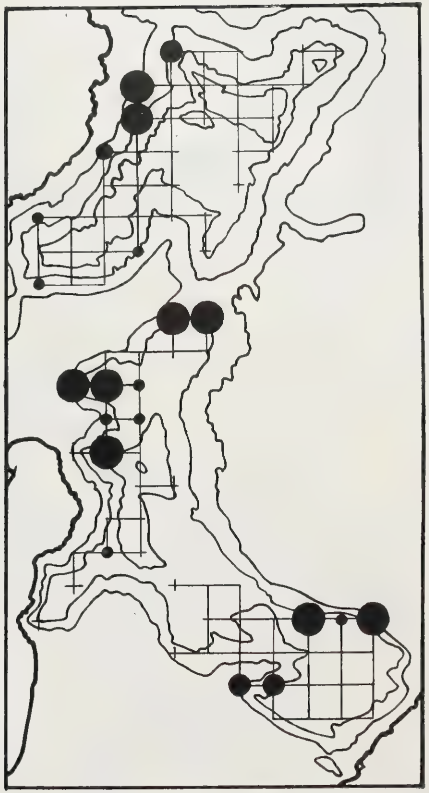
It is evident from the distribution maps that many of the less common species are rare at high altitude. It is considered that this is the outcome



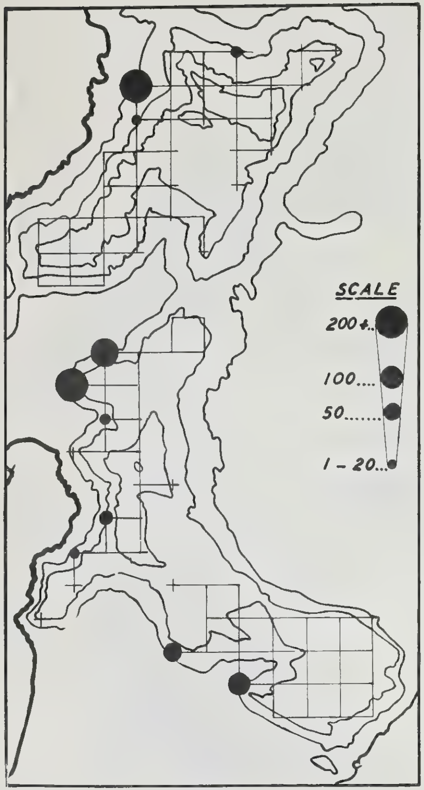
Map 1: Pinus pinaster



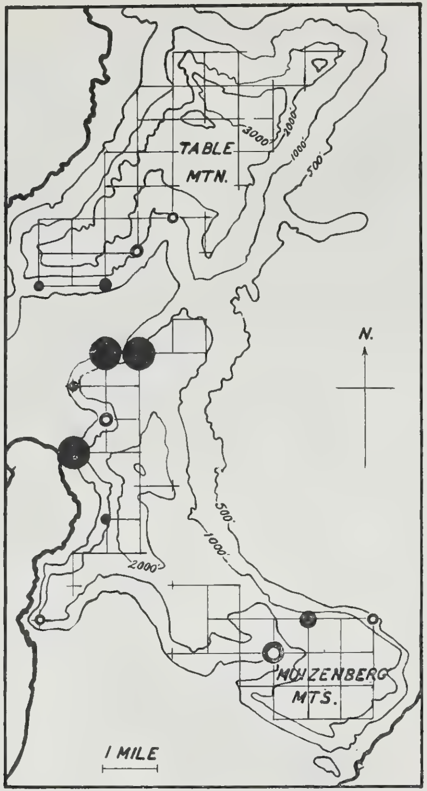
Map 2: Pinus radiata (●); P. pinea (○).



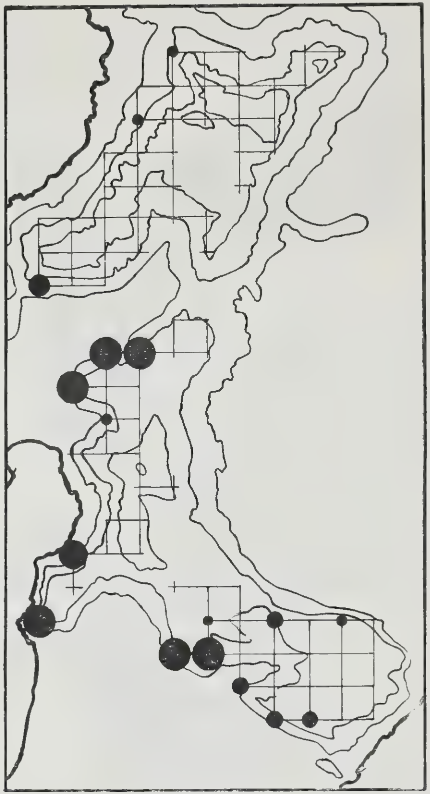
Map 3: Hakea gibbosa.



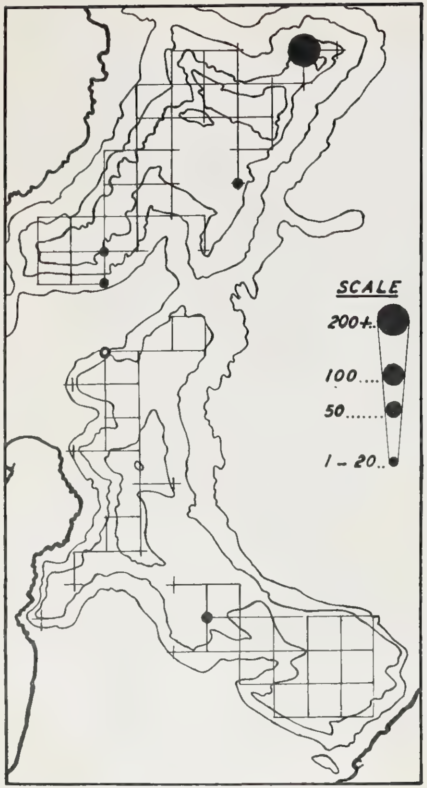
Map 4: Hakea suaveolens.



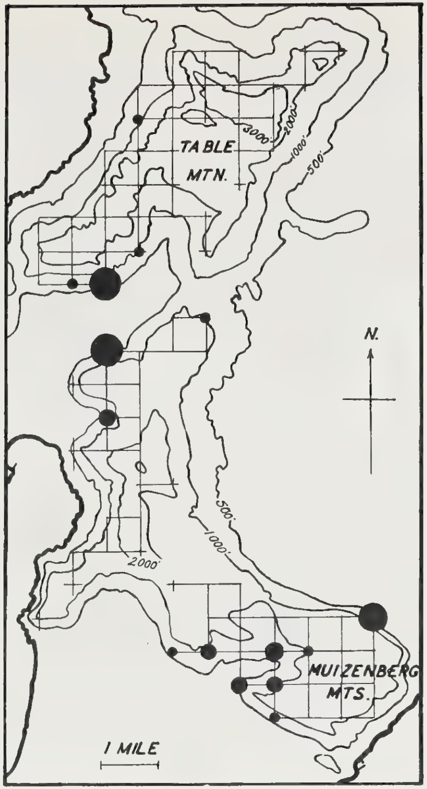
Map 5: Hakea acicularis (●); Acacia Longifolia (○).



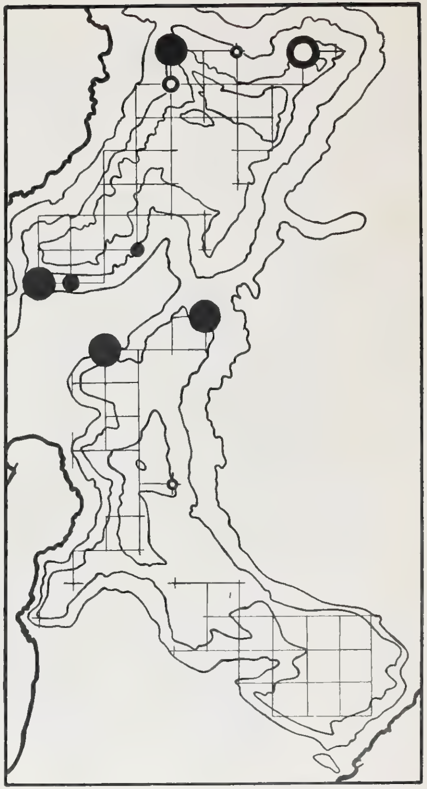
Map 6: Acacia cyclops.



MAP 7: Acacia melanoxylon (●); A mollissima (○).



MAP 8: Acacia cyanophylla.



MAP 9: Albizia lophantha (●); Eucalyptus sp. (○).

of absence of local infection sources in such areas, rather than adverse habitat conditions. Only minor differences exist between the climates of low and high altitudes, chiefly involving slightly lower temperatures and the occurrence of wind-borne summer mists on upper slopes.

Fire is a factor which may be of some significance. While no detailed study of this could be made in the present survey, it was clear in several cases that burning of vegetation containing dispersed plants of *Acacia cyclops* and *Hakea spp.* led to the formation of very dense stands of these species. This was not apparent in *Pinus pinaster*, which is generally held to be highly sensitive to injury from fire especially when young. (Zahn and Neethling, 1929). It should be added that no less than 28% of the sample points had been burnt in the previous five years.

Discussion

It is clear from the above survey that a significantly high degree of infection by introduced species exists throughout the area examined. The most widespread species, *Pinus pinaster*, is most commonly found in low to moderately high concentrations, but seldom in very dense stands. Dispersal to a given site is probably highly efficient, and some factor such as a long generation time, or frequent burning off of young individuals must be postulated for the rarity of dense colonies.

In contrast to this, the next most common species, *Hakea gibbosa*, was much less widely dispersed, although it was found in high densities in many places. The woody, fire-resistant fruits of *Hakea gibbosa* rarely open to liberate seed unless the parent plant is damaged by fire or mechanical injury. After burning therefore, very large quantities of seed are liberated. The resulting seedlings grow rapidly and form dense stands on the newly colonised burnt area, where competition is probably at a low level. The seed is winged, and can be carried by wind to adjoining areas, there to develop into mature plants and to form new colonies on the occurrence of subsequent fires. This hypothesis is borne out by the fact that a very large percentage of the plants in a stand of *Hakea gibbosa* are all approximately the same age.

A similar argument may be postulated to explain the analogous distribution pattern of *Acacia cyclops*. In this case, fire probably serves to char and rupture the extremely tough coats of seeds lying dormant near the parent plants, leading to the production of large numbers of individuals where only a few existed before. However, judging from the wider age distribution of plants in dense colonies, it seems likely that there is not quite the same dependence on fire for the production of new individuals as in *Hakea gibbosa*.

The remaining species were found individually at less than 20%, and collectively at 41% of the points examined. While this is a significant proportion of the total, it is felt that any general conclusions regarding distribution must await further autecological studies. It should be made clear however that many of these species are capable of forming dense colonies in a wide range of habitats. (See Table 2).

Finally, one must examine the likely future of the indigenous vegetation if the present spread of introduced species were to remain unchecked. While the present distribution of *Pinus pinaster* includes relatively few cases of very high densities, available data indicates that the species is capable of forming dense stands in a wide range of habitats. In such dense stands, records show that only a very small proportion of the indigenous flora is able to survive. However, limited survival may be possible on cliff faces and rocky places, where shallow and scattered pockets of soil preclude the formation of dense colonies of introduced species. The indigenous flora of such localities tends to be rather specialised however. A slightly greater survival percentage was recorded in dense stands of *Hakea gibbosa* and *Acacia cyclops*, although in both cases it was still remarkably low. Similar remarks apply to the less widely dispersed species.

Conclusions

The above data indicates that a widespread invasion of upper mountain slopes by introduced species has taken place. Unless checked, it is probable that this invasion could ultimately result in the formation of dense communities of introduced species, containing only a very limited proportion of the present indigenous flora. Such dense infections are likely to occur throughout a wide range of habitats, with the exception of the broad-leaved forest community.

Summary

The distribution patterns and ecology of a number of introduced trees and shrubs were examined on Table Mountain and an adjoining range on the Cape Peninsula, South Africa. Intersections of lines of a thousand yard grid were used as sample points for plotting distributions in the 40 square mile area.

Introduced species were found in the immediate vicinity of 95% of these points. *Pinus pinaster* Ait. was by far the most widely dispersed species, occurring at 83% of the sample points, usually at low to moderately high concentrations. The next most widely dispersed species, *Hakea gibbosa* Cav. and *Acacia cyclops* A. Cunn. were found at 24% and 20%

of the points respectively, and were often present in very high concentrations. The remaining ten species were found in varying concentrations at a total of 41% of the sample points.

Ecological relationships are discussed. It was found that the more common species were capable of forming significantly dense colonies in a wide range of habitats, with the exception of the broad-leaved forest community.

It is suggested that only a small proportion of the indigenous flora is likely to survive if the present invasion were to remain unchecked.

ACKNOWLEDGEMENTS

The author would like to express his thanks to Miss B. M. Hunter, former student in the Department of Geography, University of Cape Town, for invaluable advice and assistance in carrying out this survey. The author would also like to thank Mr. J. C. Loon of the Department of Land Surveying of the above Institution for his helpful advice and load of equipment.

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NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

By H. M. L. Bolus.

Astridia speciosa.—Planta 1 visa, ca. 20 cm. alta; partes herbaceae velutinae; folia supra visa oblonge ovata vel oblique ovata vel lanceolata, obtuse carinata, lateribus leviter convexis, lat. visa semi-ovata, (pari interdum circulum fere formante), vel oblonge semi-ovata, obtusa vel apice subrotundata, duo paris leviter inaequilonga, ad 6·5 cm. longa, medio ad 1·6 cm. lata diametroque ad 2 cm.; flos 1 visus, subsessilis, 6.5 cm. diam.; bracteae lat. visae oblique ovatae acutae, 1·3 cm. longae, ad 8 mm. diam.; receptaculum globose obconicum, 6·5 mm. longum, ad 9 mm. diam.; sepala 6, e prope basim gradatim angustata, acuta, omnia apice ± subulata, 2 extima 8—9 mm. longa, basi 5—6 mm. lata,cetera 9—10 mm. longa, basi 4—5 mm. lata ampleque marginata; petala 6-seriata, exteriora inferne e prope medium angustata, obtusa vel emarginata, rubre aurantiaca, ad 3.2 cm. longa, 2—3 mm. lata, interiora 1—2 cm. longa, 0·25—1 mm. lata, acuta vel acuminata, gradatim in staminodia abeuntia; staminodia pauca, stamina conice conferta saepius excedentia; filamenta ca. 6-seriata, ad 1·1 cm. longa, inferne pallida, superne lutea, exteriora inferne ciliate papillata, intima paulo supra medium papillata, antheris pollineque aureis; discus conspicuus; ovarium circa marginem fere planum, medio abrupte 6-lobatum, lobis valde compressis, fere ad 2 mm. elevatis; stigmata 6, gracilia, superne longe attenuata, 1—1·2 cm. longa; semina non visa.

South West Africa: "5 miles N. of Sendlings Drift", March 1960, *H. Hall* 1869. Fl. Jun. 1960. N.B.G. 175/60.

Conophytum complanatum (*Piluliformia*).—Glabrum; vaginae persistentes pergamentaceae, inferne brunneae, superne griseae, brunneo punctatae, senectae papyraceae, saturate brunneae, senectissimae atratae; corpuscula obovata vel clavata tumque basi stipitata, supra fere circularia, complanata, rarius immaculata, costa leviter elevata, e medio oris oriente et ad marginem attingente interdumque linea obscura punctarum approximatarum ornata, deinde e medio hujus lineae linea altera punctarum, leviter curvata, oriente adque extremitatem oris attingente, rarius punctis sparsis saturatiore viridibus additis, 7—11 mm. longa, apice ad 6 mm. lata, ad 7 mm. diam., ore leviter depresso, glabro, ad 1.5 mm. longo; bracteae obtusae, pedunculum 2 mm. inclaudentes, basim receptaculi 1.5 mm. longi, 2 mm. diam., attingentes; calyx subherbaceus, 3—4 mm. longus, tubo ad 2 mm. longo, dimidio incluso, segmentis 4, obtusis vel acutis, brunneis, rubre papillosis, 1.5—2 mm. longis; corolla 6—7 mm. longa, tubo cylindrico pallido, ad 4 mm. longo, segmentis 2—3-seriatis, acutis vel acuminatis, aureis vel aurantiacis, vel rarissime albidis, marcescentibus, ad 3 mm. longis, 0.25—0.5 mm. latis; stamina ca. 14, 2-seriata, supra medium tubi adnata, albida, filamentis brevissimis, antheris 1·25 mm. longis, omnibus ± manifestis; discus conspicuus, fere ad 0·5 mm. elevatus; ovarium conice elevatum, discum leviter excedens; stylus pallidus, 0·75 mm. longus, stigmatibus 4, obtusis rubris, 1·5 mm. longis.

Cape Province: in dit. Prince Albert; Laingsburg, Oct. 1959, *R. C. Littlewood*. Karoo Garden 803/59. Fl. Apr. 1960.—*C. calitzdorpensi* valde affine fortasseque varietas mera.

Conophytum membranaceum (*Subrisa*).—Planta cum floribus 3 cm. alta, 5.5 cm. diam.; corpuscula dense conferta, subovalia vel subobovata vel subpiriformia, supra convexula, ore leviter depresso, glabro, sine fossis terminalibus, 2·25 mm. longo, immaculata, sat pallide viridia, 4—6 mm. longa, apice 4—5 mm. diam.; flores nocturni fragrantes; pedunculi 2—3 mm. longi, bracteis basalibus papillatis, 0.75 mm. longis; receptaculum globosum, 1 mm. longum; calyx omnino exsertus, 3—4 mm. longus, membranaceus (itaque nomen) vel segmentis 4, in alabastris partim herbaceis papillatisque, obtusis aequilongis, 1 mm. longis, mox marcescentibus membranaceisque; corolla 8—11 mm. longa, tubo cylindrico, 3—5 mm. longo, segmentis 3-seriatis, exterioribus acutis vel obtusis, rubre aurantiacis vel cupreis, 0·5 mm. latis, interioribus obtusis, luteis vel aureis; stamina 2-seriata, e parum supra medium orientia, antheris omnibus manifestis, luteis; discus conspicuus, profunde divisus, segmentis ca. 7, subtruncatis, saturate viridibus; ovarium planum, medio tantum leviter elevatum ibique ad medium disci vix attingens; stylus viridis, 0·75 mm. longus, stigmatibus 4, gracillimis purpureis, fere ad 2·5 mm. longis.

Cape Province: Namaqualand; "20 miles S. of Port Nolloth, Nov. 1960, *H. Hall* 2165. N.B.G. 1010/60. F. Jan.—Feb. 1961.

Conophytum longitubum (*Euconophytum*).—Planta 1 visa, compacta, 2 cm. alta, 3.5 cm. diam.; reliquiae inferne papyraceae brunneae, "nervis" sat conspicuis, superne saturatiores vel demum atratae; corpuscula 8—11 mm. longa, 6—9 mm. diam., obconica velpirifor mia, minutissime papillata, lateribus saepe purpureis, supra circularia vel elliptica si duo in vagina evoluta sunt, leviter convexa, sordide viridia, punctata, punctis ad 0.5 mm. diam., saturatioribus, sparsis vel 2—4 approximatis lineamque brevem formantibus, ore ad 2 mm. longo, subridente, minute ciliato, ciliis sat profunde positis, supra visis patentibus; pedunculus 3—4 mm. longus, basi bracteatus, bracteis inter maximas in hac sectione visis, ad 4 mm. longis, herbaceis, lobis obtusis papillatis, tubum aequantibus, sinu lato; receptaculum globosum, ad 3 mm. diam.; calyx in alabastro herbaceus, 7 mm. longus, tubo 5 mm. longo, segmentis 4, 1—2 mm. longis, interioribus anguste membranaceo marginatis, demum in flore maturo submembranaceus; corolla alba, 1—1·2 cm. longa, tubo 5—6 mm. longo, segmentis 3—4-seriatis, obtusis, 0·5—0·75 mm. latis; stamina 3-seriata, omnia exserta, infima parum supra medium tubi posita, filamentis albis, antheris pallidissime stramineis; discus brevissime divisus, segmentis ca. 9, truncatis, fere integris; ovarium profunde concavum, medio conice elevatum, altitudinem disci attingens; stylus 0.5 mm. longus, stigmatibus pallide purpureis, 1—1·5 mm. longis.

Cape Province: in dit. Worcester; "on the farm Avondrust, 4 miles E. of Touw's River", Maio 1959, *R. C. Littlewood.* Karoo Garden 91/59. Fl. Apr. 1960.—"This is confined to one koppie of a group of seven, which are surrounded by an area of flat sandy ground that extends for miles. There is no link with any of the mountain ranges". (Littlewood.)

Lampranthus francisci.—Erectus glaber, sat robustus, 60 cm. altus, 90 cm. diam.; caulis 3 cm. diam.; rami primarii 25—30 cm. longi, 4—6 mm. diam., internodiis 2·5—6 cm. longis; ramuli ultimi saepe 6—8-foliati; folia ascendentia, supra plana, carinata, lateribus convexis, lat. visa prope apicem tantum angustata, breviter apiculata, fere levia, tactu subvelutina, sat pallide viridia, 2·5—4·5 cm. longa, medio 3—6 mm. lata, 4—6 mm., vel rarissime ad 7 mm., diam. tumque subfalcata, vagina 4—5 mm. longa, interdum inconspicue impresse lineata; cymae 3—4- ternatae, 4—7 cm. longae, 5—9 cm. diam., 11—25-florae, pedunculis 4—5 cm. longis, ultimis 6—12 mm. longis, lateralibus prope medium bracteatis, bracteis 3—10 mm. longis; flores odorati, 3—4·3 cm. diam.; receptaculum obconicum, 4—5 mm. longum, 5—6 mm. diam.; sepala 5, acuta, omnia ± marginata, subaequilonga, exteriora 5—6 mm. longa, basi 3—7 mm. lata; petala 2-seriata, subaequilonga, inferne leviter vel vix angustata, obtusa, pulchre rosea, sicca inconspicue vittata, ad 1·3 cm. et 1·8 cm. longa, 0·75—1·25 mm. lata; staminodia nulla; filamenta 5—6-seriata, alba, 1—5 mm. longa, exteriora nuda, interiora paulo infra medium dense papillata, antheris 0·75 mm. longis, cum polline stramineis; discus sat inconspicuus crenulatus; ovarium circa marginem concavum, lobis erectis approximatis obtusis nitentibus, ad 1·5 mm. elevatis; stigmata 5, subulata, breviter caudata, ad 4 mm. longa; capsulae hornotinae multae visae, rubre brunneae, infra obconicae, in pedunculum gradatim abeuntes, ad 5 mm. longae, supra ad 2 mm. elevatae, suturis subringentibus, 7—9 mm., expansae ad 1·3 cm., diam., valvis late patentibus, carinis erectis integris, basi parallelis, superne divergentibus, medium valvae vel paulo ultra attingentibus, arista vix visa, alis amplis dimidio superiore libero, apicem valvae attingentibus, alis tegentibus dimidium loculi attingentibus; semina obovata levia, pallide brunnea, 1 mm. longa.

Cape Province: in dit. Ceres; Karoopoort, Mart. 1960, *Frank J. Stayner*. Karoo Garden 240/60. Fl. Nov. 1960.

Lampranthus littlewoodii.—Glaber, laxe parceque ramosus ("straggling"), 23 cm. altus, 35 cm. diam.; caulis basi 8 mm. diam.; partes herbaceae leves, pallide glauce virides; rami primarii ad 16 cm. longi, internodiis 2—4 cm. longis, ad 3 mm. diam.; ramuli ultimi crebre 12—14-foliati; folia fere erecta, demum patentia, saepe subfalcata, supra plana acuta. dorso rotundata vel cum aetate subcompressa obscureque obtuse carinata, lateribus subconvexis, lat. visa obtusa vel subacuta, interdum superne leviter ampliata, 1—2·5 cm. longa, medio 1·5—2 mm, lata, 2—3 mm. diam., vagina 1 mm. longa; flores 3-nati vel 2-ternati, meridiani, 2·3—3 cm. diam.; pedunculi teretes, 1—1·5 cm., vel rarius ad 2 cm., fructiferi ad 3 cm., longi, omnes prope medium bracteati, bracteis foliis simillimis, 5—7 mm. longis; receptaculum obconicum, 4 mm. longum, ad 5 mm. diam.; sepala 5, e paulo supra basim angustata, superne ± subulata, acuta vel acuminata, 4—5 mm., vel 5—6 mm. longa, basi 1·5—2 mm., vel 2—3 mm., lata, interiora exterioribus interdum latiora, ample brunneo marginata; petala pulchre rosea, exteriora ca. 3-seriata, inferne sat conspicue angustata, saepius obtusa, 1—1·4 cm. longa, 1—2 mm. lata, interiora 3—4-seriata, gradatim angustiora, inferne non vel vix angustata, acuta vel obtusa, 4—8 mm. longa, 0·25—0·5 mm. lata; staminodia vera nulla sed petala intima diu erecta, ad basim staminum subappressa; filamenta mox suberecta, 3—4-seriata, pallide rosea, 2—4 mm. longa, extima nuda, intima prope basim dense papillata, antheris pollineque pallide stramineis; discus crenulatus; ovarii lobi sat distantes, obtuse compressis, ad 0·75 mm. elevati; stigmata 5, profunde posita, viridia, inter minima in genere, 1·5 mm., vel vix ad 2 mm., longa cum cauda 0·75 mm.; capsula infra obconica, 5—6 mm. longa, supra ad 2 mm. elevata, suturis leviter compressis, 6—7 mm., expansa 9—10 mm., diam., valvis late patentibus, carinis fere erectis, e basi divergentibus, dimidium valvae attingentibus, minute lacerulatis, arista minuta, alis apicem valvae attingentibus vel paulo brevioribus.

Cape Province: Namaqualand; "2 miles N. of Khamieskroon", Oct. 1959, *R. C. Littlewood*. Karoo Garden 581/59. Fl. Nov.—Dec. 1960.

Lampranthus subtruncatus (§*Tenuifolii*) L. Bol., "Mesemb." III, 159 (1939)—var. **wupperthalensis.**—Rami 3 visi compacti, ad 23 cm. longi, sat rigidi, crebre ramulosi; folia primaria matura vel delapsa ad

2·5 cm. longa, cicatricibus triangulis acutis; stigmata ad 2·5 mm. longa; capsulae plures visae (in forma typica non descriptae), infra 5—7 mm. longa, 8—10 mm. diam., obconicae 5-angulatae, costis 5 alternantibus, pallide brunneae, supra saturate brunneae, per 2 mm. elevatae, suturis leviter, vel versus medium capsulae sat valde, compressis, expansae ad 1·4 cm. diam., valvis late patentibus, carinis e basi divergentibus, deinde incurvatis, aristis contiguis fereque apicem valvae attingentibus, marginibus lacerulatis, 1·5 mm. latis; semina fere circularia, muricata, saturate brunnea, ca. 1·25 mm. longa.

Cape Province: in dit. Clanwilliam; Wupperthal, Sept. 1959, *R. C. Littlewood.* Karoo Garden 380/59. Fl. Nov. 1960, fruct. Feb. 1961.

Opophytum australe.—Plantae in horto a seminibus ortae; rami vivi plures visi, ad 25 cm. longi, ad 1 cm. diam., internodiis 1—3 cm. longis; partes herbaceae leves, laete virides, minutissime papillatae, papillis nec elevatis nec nitentibus; folia alterna, supra leviter convexa vel plana vel "cum aetate leviter concava," dorso rotundata, "1·2—6·6 cm. longa, 5—8 mm. diam."; flores per diem noctemque expansi; pedunculi 1—3 cm. longi, 4—7 mm. diam.; receptaculum globose obconicum, 9 mm. longum, 10 mm. diam.; calycis tubus 6—7 mm. longus, segmentis valde inaequilongis, 3 foliaceis subteretibus, 1—2 cm. longis, 4—5 mm. diam., 2 intimis fere omnino membranaceis, 5—8 mm. longis; corolla ad 8 cm. longa, tubo pallide viridi, ca. 2 cm. longa, segmentis pluriseriatis, basi 0·75 mm. latis, superne capillaribus roseis; staminodia staminaque multiseriata, filamentis ad 1·5 cm. longis, antheris pollineque pallide luteis; fossae nectariferae ad 4 mm. longae; ovarium obtuse 5-angulatum, ad 6 mm. pyramidate elevatum, parte ovulifera fere inferiore; stigmata 5, gracilia, ad 1·8 cm. longa; capsulae 6 visae, pallidae, 1·4—1·6 cm. longae, infra subclavatae, conspicue obtuseque 5-angulatae, suturis compressis, supra ad 1 cm. elevatae, ad 1 cm., vel expansae 2·2 cm., diam., valvis celerrime (*within* 30 *seconds*) patentibus (alis erectis) recurvatisque (alis patentibus), carinis arte appressis, minutissime serrulatis, ad 1·25 mm. altis, partem tertiam valvae attingentibus, alis omnino coalitis vel prope apicem liberis, saepe breviter lobatis, apicem carinarum attingentibus; semina permulta, fere rotundata, pallida, micropyla brunnea, ad 1 mm. longa.

Cape Province: Namaqualand; "21 miles N. of Khamieskroon, May 1960, *R. C. Littlewood.* Karoo Garden 961/60. Fl. Jan. 1961. "No cultivation whatever was given to the plants in the Karoo Garden."

The following collections from Namaqualand, represented in the Bolus Herbarium and arranged in chronological order, have calyx-segments similar to those of the species described above—(1) *M. Schlechter*

7. (2) *Percy Sladen Memorial Expedition* 5986. (Sandy river-bed between Modderfontein and Doornpoort.) Common from Chubiessis outspan to Daunabis. (3) *Pillans*, (1 mile S.E. of Viols' Drift, Sept. 1931). (4) *Leighton* 2862. (Richtersveld, Hell's Kloof, in sand, Dec. 1946). (5) *H. Meyer*. Soebatsfontein, Sept. 1950.

The first of these bears the MS. name "*M. gariepinum*" and is without fruit. My brief notes on the second were published in 1913 (Ann. S.A. Mus. IX, 151) with the remark that "until fresh material is available it seems advisable not to name it". In 1928 (Gard. Chron. 84,253) N. E. Brown enumerated 5 species of **Opophytum,** among them being "*O. speciosum* N.E. Br. (described without a name in the Ann. S. Afr. Mus. IX, 151 and will be described fully later on)." This description was not published, and complete living material from that area is still required before a satisfactory one can be made. Meanwhile, as the only capsule (an imperfect one) on our specimen of 5986 has much shorter valves than those of K. G. 961/60, and with the keels reaching the middle of the valve, and as the corolla of the latter is much longer and its segments pink, and especially as there is excellent material to deal with, this most southerly collection is described as a new species. The three remaining collections are without fruit, but are probably forms of this species.

Included in the 5 species of *Opophytum* enumerated by N. E. Brown is *Mesemb. fastigiatum* Thunb. This is described by Thunberg as having the leaves opposite, ovate, connate, papulose, about 1 inch long," and is obviously misplaced in this genus. It might be the same as the earlier **Micropterum papulosum** (L.f.) Schwant.

Psilocaulon candidum.—Glabrum, "33 cm. altum, ad 1·30 met. diam." (*Littlewood*); rami inter gracillimos in genere, 30—40 cm. longi, 1—2 mm., vel rarius ad 3 mm., diam., nodis leviter constrictis, internodiis saepius 1·5—2 cm. longis, minute papillatis, papillis subelevatis ellipticis, ramuli floriferi interdum fastigiati; folia dorso rotundata, ad 1·6 cm. longa; flores meridiani, ad 1·5 cm. diam.; pedunculi graciles, 5—10 mm. longi, in receptaculum anguste obconicum, ad 2·5 mm. longum, 2—3 mm. diam., gradatim abeuntes; calycis tubus 0·75 mm. longus, segmentis 5, in alabastro apice subincrassatis, acutis, novellis apiculatis, omnia ± marginatis, 3—4 mm., vel 4—5 mm., longis, basi 1·5—2 mm. latis; corollae segmenta 2—3-seriata, inferne vix angustata, acuta vel obtusa, candida, apice interdum pallide roseo suffusa, ad 6 mm. longa, 0·5—0·75 mm. lata; staminodia hyalina, alba vel apice fusca, fere integra vel inconspicue lacerulata, exteriora laxa, interiora appressa, 5 mm. longa, vix ad 1 mm. lata; filamenta ca. 4-seriata, candida, antheris pollineque stramineis; ovarium obtuse angulatum, ad 1·5 mm. elevatum; stigmata 5, gracillima, 3·5—4 mm. longa.

Cape Province: Namaqualand; Ratel Poort, Oct. 1959, *R. C. Littlewood.* Karoo Garden 631/59. Fl. Nov.—Dec. 1960.

Psilocaulon namaquense Schwant., Gfl. (1928) 69; N.E.Br., Gard. Chron. (1928 II) 254. *Mesembryanthemum simile* Sond. var. *namaquense* Sond., Flor. Cap II, 435 (1862).—Glabrum, ad 90 cm. altum, ca. 1·30 met. diam.; rami primarii ad 44 cm. longi, internodiis 2·5—3 cm. longis, 2—4 mm. diam.; partes herbaceae leves politaeque, sat sordide virides; folia dorso rotundata, lat. visa prope apicem angustata, acuta, ad 2 cm. longa, 1·5—2·5 mm. diam., flores meridiani, 1·3—1·5 cm. diam.; pedunculi in receptaculum 2—3 mm. longum, 3—4 mm. diam., gradatim abeuns; calycis tubus ca. 0·5 mm. longus, segmentis 5, in alabastris saepius subaequilongis, maturis dorso convexis, saepissime acuminatis, apiculatis, omnibus ± marginatis, marginibus intimis amplis, 4—6 mm. longis, basi 1—2 mm. latis, vel in flore altero 4—6 mm. longis, basi 2—3 mm. latis; corollae tubus vix 0·5 mm. longus, segmentis 2-seriatis, inferne non vel vix angustatis, obtusis purpureoroseis, 4—6 mm. longis, 0·5—1 mm. latis; staminodia stamina subaequantia, inferne alba, superne pallide rosea, integra vel inconspicue lacerulata, ad 0·75 mm. lata; filamenta 3-seriata alba, ad 4 mm. longa, antheris pollineque stramineis; ovarium obscure angulatum, ad 1 mm. elevatum; stigmata 5, gracillima pallida, 3 mm. longa.

Cape Province: Namaqualand; Ratel Poort, Oct. 1959, *R. C. Littlewood.* Karoo Garden 607/59. Fl. Nov.—Dec. 1960.

The first publication (about 100 years ago) of this name was used by Sonder to denote a variety, which has since been raised to specific rank. Nothing, however, seems to have been added to Sonder's brief description. The notes given above were made on ample and excellent material which match specimens of *M. Schlechter* 36 (Steinkopf, Nov. 1897) that were compared with a photograph of the type of **P. namaquense.** The identification is therefore somewhat doubtful, but it does not seem possible to make it more exact when dealing with scanty dried material only and with no precise locality given beyond "Namaqualand".

Psilocaulon littlewoodii.—Glabrum, "ca. 16 cm. altum, 80 cm. diam.; caulis 8—10 mm. diam."; partes herbaceae vivae minute papillatae, papillis politis, saepius circularibus, in siccis invisis, vel in receptaculo et calyce nitentibus; rami decumbentes vel prostrati, ad 35 cm. longi, crebre ramulosi, cum ramulis ascendentibus vel fere erectis, flexuosi, nodis saepius valde constrictis, internodiis saepius ad 3—10 mm. longis et ad 2 mm. diam.; ramuli ultimi cum floribus saepius 1—2·5 cm. longi; folia supra plana, dorso rotundata, lateribus convexis, lat. visa prope apicem abrupte angustata, apiculata, ad 1 cm. longa, ad 2·5 mm. diam.;

flores crebri meridiani, ad 1 cm. diam.; pedunculi saepius 2—5 mm. longi, a receptaculo obconico, 1·5—2 mm. longo, 2—2·5 mm. diam., vix distincti; calycis tubus brevissimus, segmentis 5, acutis vel extimo obtuso, intimo acuminato, 3—4 mm. longis, basi 0·75—2 mm. latis, 3 marginatis; corollae segmenta ca. 3-seriata, inferne non angustata, obtusa, purpureorosea vel fere subrubicunda, 3—5 mm. longa, ad 0·25 mm., vel rarius ad 0·5 mm., lata; staminodia prope apicem attenuata, saepe tenuiter acuteque lacerata, prope basim subhyalina alba, superne rosea, stamina excedentia; filamenta 2—3-seriata, pallide rosea; ovarium sat obtuse 5-angulatum, ad 1 mm. elevatum; stigmata 5, gracillima, pallide rosea, ad 2·5 mm. longa.

Cape Province: in dit. Vanrhynsdorp; "8 miles N. of Vanrhynsdorp," Oct. 1959, *R. C. Littlewood.* Karoo Garden 591/59. Fl. Nov.—Dec. 1960.

P. littlewoodii forma.—Habitus laxior robustiorque quam in forma typica; rami ramulique minus flexuosi, internodiis ad 3 cm. longis, ad 4 mm. diam.

Cape Province: in dit. Vanrhynsdorp; "6 miles E. of Vredendal" Sept. 1959, *R. C. Littlewood.* Karoo Garden 629/59. Fl. Nov.—Dec. 1960.

Psilocaulon oculatum.—Glabrum, "3 feet in diameter, inclined to sprawl" (Littlewood); partes herbaceae minutissime crebreque papillatae, papillis leviter elevatis politis; rami laxe ramulosi, internodiis 8—20 cm. longis 1·5—3 mm. diam.; ramuli ultimi floriferi ascendentes, 2—5 cm. longi; folia supra sulcata acuta, dorso rotundata, lat. visa superne vix angustata, obtusa, ad 2 cm. longa, 2—3 mm. lata diametroque; flores meridiani, 1·5—1·8 cm., vel demum post dies plures ad 2 cm., diam.; pedunculi in floribus maturis a receptaculo obconico, 2 mm. longo, 3 mm. diam., distincti, saepius 3—5 mm. longi; calycis tubus ca. 0·5 mm. longus, segmentis 5, extimis superne subteretibus, acutis vel obtusis, medio leviter constrictis, interioribus acutis vel acuminatis, in alabastro saepe valde inaequilongis, exterioribus ad 8 mm., intimis 3 mm., longis, in flore maturo 3—6 mm., vel 4—6 mm., vel 5—8 mm., longis, basi 1·5—2·5 mm. latis; corollae tubus brevissimus, segmentis 2—3-seriatis, inferne non, vel leviter, angustatis, obtusis, dimidio inferiore albo, oculum formante, superiore pulchre roseo, vel intimis albis, in staminodia abeuntibus, 6—9 mm. longis, 0·5—1 mm. latis; staminodia hyalina, obtusa vel acuta vel acute lacerulata, ad 6 mm. longa, ad 1 mm. lata; filamenta 3—4-seriata, alba, ad 6 mm. longa, antheris pallide stramineis; ovarium acute subprofundeque 5-angulatum, minute papillatum, ad 1·5 mm. elevatum; stigmata 5, gracilia, longe attenuata, ad 4 mm. longa; capsulae multae visae, infra obconicae, 2 mm. longae, supra ad 3 mm. elevatae, suturis compressis, ad 4 mm., expansae 8—10 mm., diam.; semina compressa, fere semicircularia, embryone muricato, saturate brunnea, 1 mm. diam.

Cape Province: in dit. Clanwilliam; prope Clanwilliam, Oct. 1959, *R. C. Littlewood.* Karoo Garden 640/59. Fl. Nov.—Dec. 1960.

Psilocaulon simulans.—"Plantae prostratae, maximae visae ca. 90 cm. diam., dense floriferae" (*Stayner*); partes herbaceae minutissime papillatae, tactu leves, siccae subasperulae; nodi in ramulis florentibus saepius non constricti internodiaque 1—2·5 cm. longa, in ramulis sterilibus, saturate olivaceis, conspicue constricti, internodiaque 4—6 mm. longa; folia novella tantum visa, dorso rotundata, 5—6 mm. longa, 1 mm. diam., in ramulis florentibus marcescentia, ad 1.3 cm. longa, in ramulis seriore producta ad 2.6 cm. longa, 2—3 mm. diam.; flores ad 1.2 cm. diam., in ramulis ultimis, saepius 1.5—2.5 cm. longis, dispositi; pedunculi a receptaculo 2 mm. longo, 3 mm. diam., vix distincti, 1—7 mm., fructiferi ad 15 mm., longi; calycis tubus ad 0.75 mm. longus, segmentis 5, obtusis vel intimo acuto, omnibus + marginatis, 2—3 mm., vel 3—4 mm., longis basi 1—2 mm. latis; corollae tubus brevissimus, segmentis 2-seriatis, prope basim leviter angustatis, obtusis aureis, 4—5 mm. longis, ad 1 mm. latis; staminodia nulla; stamina 3-seriata, primum erecta, mox late patentia (ovario ab initio bene exposito), lutea, ad 3 mm. longa; ovarium acute, sed non profunde, angulatum, ad 1·75 mm. elevatum; stigmata 5, subulata aurea, 0·75 mm. longa (brevissima in genere visa); capsula supra ad 2 mm. elevata, valvis ringentibus, apice 3 mm., expansa 6 mm., diam.; semina late obovata, saturate brunnea, vix ad 0·5 mm. longa.

Cape Province: in dit. Beaufort West; "21 miles S. of Beaufort West on the road to Klaarstrom", Nov. 1, 1960, *F. J. Stayner.* Karoo Garden 806/60.

The flowers of this species closely resemble those of **Mesembryanthemum excavatum** L. Bol. and of **M. chrysum** L. Bol., the latter differing from the other two in having more slender and longer stigmas. The absence of staminodes in all three cases makes them anomalous in both genera. Vegetatively the first two having leaves mostly alternate, and herbaceous parts crystalline papillose, are in accord with **Mesembryanthemum,** and the last has the consistently opposite leaves and constricted nodes of **Psilocaulon.** The name *simulans* (= imitating) refers to the remarkable resemblance existing between these flowers and those of the two earlier species.

Psilocaulon stayneri.—Plantae glabrae, "50 cm. altae, 1 met. diam."; rami primarii vivi plures visi; ad 59 cm. longi, ad 4 mm. diam., nodis vix constrictis, internodiis 5—6 cm. longis, laxe copioseque ramulosi;

ramuli ultimi 2—4 cm. longi, saepe 6—7-fl., novi steriles nodis constricti; partes herbaceae pallide olivaceae, minutissime papillatae, papillis non, vel rarius leviter, elevatis; folia fere erecta vel patentia, subteretia, lat. visa apice leviter angustata apiculataque, 4—16 mm. longa cum vagina 0·5 mm., novella ad 3 mm., matura 2 mm., diam.; flores per diem noctemque expansi, ad 1·6 cm. diam.; pedunculi crassi, a receptaculo 2—3 mm. longo, 3—4 mm. diam., non vel vix distincti, saepius 3—5 mm. longi, 2—3 mm. diam.; calycis tubus ad 1 mm. longus (in genere longus), segmentis 5, in alabastris subteretibus saepeque valde inaequilongis, exterioribus ad 6 mm., interioribus 2—3 mm. longis, in flore maturo submarcescentibus, 1·5—3 mm. vel 2—4 mm. longis, basi 1—2·5 mm. latis, omnibus ± marginatis; corollae tubus ca. 1 mm. longus, segmentis 3-seriatis, laxissime positis, obtusis, primum pallidissime, deinde paulo saturatiore, roseis, ad 6 mm. longis, 0·25 mm., vel apice ampliatis ad 0·5 mm., latis (inter angustissima in genere); staminodia crebra, diu appressa, obtusa, integra vel apice ± lacerulata, hyalina, staminibus longissimis aequilonga vel paulo breviora, ad 1 mm. lata; filamenta ca. 3-seriata, complanata, ad 4—5 mm. longa, antheris pollineque pallidissime stramineis; ovarium sat acute angulatum, 0·75—1·5 mm. elevatum; stigmata 5, intus aurea, 4—5 mm. longa.

Cape Province: in dit. Calvinia; "30 miles N. of Nieuwoudtville" Dec. 1959, *F. J. Stayner*. Karoo Garden 893/59. Fl. Nov.—Dec. 1960.

Correction.

The combination **Psilocaulon otzenianum** (Dtr.) L. Bol., "Mesemb." II, 31 (Dec. 1928) is erroneous, the error being the result of a label (*Dinter* 3789) belonging to a species of **Lampranthus** being attached to a specimen, of a **Psilocaulon.** The confusion was discovered by Dr. Friedrich and was mentioned by him in a letter to Mr. Herre, who has kindly drawn my attention to it. The masquerading **Psilocaulon** is still to be determined. As far as I am aware **M. otzenianum** Dtr. has not yet been published as a **Lampranthus.** It was described in Aug. 1923 (Fedde. Repert., Band XXIII, 152), and according to the description (we have not seen the type) it seems to be the same as **M. spathulatum** L. Bol. which is probably only a larger-flowered form of **Lampranthus uniflorus** (L. Bol.) L. Bol., published in Sept. 1922 as **Mesemb. uniflorum** (Ann. Bol. Herb. III, 135).

Stoeberia apetala.—Planta 1 visa, glabra, 17 cm. alta, parte inferiore compacta, ramis sterilibus ramulisque crebre foliatis, foliis hornotinis 2—4 vel rarissime ad 6, ramis florentibus elongatis, cum floribus 12 cm. longis, internodiis senectis ad 3 cm. longis, 2 mm. diam., ramulis lateralibus crebre 4—6-foliatis; folia ascendentia vel patentia, supra plana acuta vel subobtusa, novella breviter apiculata, apiculo centrali, dorso rotundata, carina nulla vel ad lineam reducta, lateribus convexis, lat. visa apice rotundata, juvenilia superne non vel vix ampliata, maxima subclavata vel rarius subspathulata, indumento subfarinoso, cinereo vel atrato (? fungo), in siccis ceram tenuem simulante quae demum disrupta deciduaque est, ad 2 cm. longa, 5—6 mm. lata, paulo infra apicem ad 8 mm. diam., vagina 2—3 mm. longa; flores 3-nati vel 2-ternati, cyma 2·5 cm. longa; pedunculi cymarum 3 cm., ultimi 2—3 mm., fructiferi 4—6 mm., longi; bracteae basalibus, ad 7 mm. longis cum vagina 2 mm. longa; receptaculum globose obconicum, 3 mm. longum, ad 5 mm. diam.; sepala 5 (in floribus 2 dissectis) sat marcescentia, e paulo supra basim superne angustata, acuta vel subacuta, omnia ± marginata, 3—4 mm. longa, basi 2—3 mm. lata; petala nulla; staminodia ad stamina conice conferta appressa intertextaque, ea aequantia vel excedentia, cum filamentis 4-seriatis superne roseopurpurea; filamenta intima prope apicem papillata, antheris pollineque pallide stramineis; discus conspicuus, fere ad basim divisus; ovarii lobi contigui inconspicui, dorso complanati, 0·75 mm. elevati; stigmata 4 et 6 visa, anguste subulata, intus conspicue longe papillata, papillis pallidis, externe atropurpurea, 1·25 mm. longa; capsula ad 7 mm. longa diametroque, infra obconica, obtuse 5—6-angulata, ad 6 mm. longa, suturis compressis, in aperta valvis permanente erectis, carinis inconspicuis, dimidium valvae attingentibus, alis subinflexis, late oblongis, apicem valvae non attingentibus, alis tegentibus dimidium loculi attingentibus; semina echinata obovata brunnea, ca. 1 mm. longa.

South West Africa: Orangemund, Nov. 1960, *H. Hall* 2144.

The plant described was drought-stricken. A second plant now doing well at Kirstenbosch may afford matter for further noting.

Trichodiadema stayneri.—Planta 1 visa, sat juvenis (in anno secundo, ut videtur), cum floribus 4 cm. alta, 7 cm. et 10 cm. diam.; caulis 5 mm. diam.; radix tuberosa, ad 7 mm. diam.; rami primarii patentes vel ascendentes, teretes, minutissime papillati, cum aetate asperuli vel fere leves, ad 6 cm. longi, internodiis 1—4 mm., vel rarius ad 10 mm., longis, 1·5—2 mm. diam.; ramuli floriferi crebre 4—8-foliati, internodiis saepe invisis; folia ascendentia vel patentia, supra plana, superne angustata, obtusa vel subacuta, dorso rotundata, lat. visa superne non, vel leviter, angustata, 7—11 mm. longa, medio ad 2·5 mm. lata diametroque, papillis minutis esetiferis vel seta minutissima centrali onustis, setis terminalibus radiantibus ad 6 visis, gracillimis pallidis, facile deciduis, 1—2 mm. longis; flores meridiani; pedunculi 3—6 mm. longi; receptaculum obconicum, 3—4 mm. longum, 4—5 mm. diam., apicem versus cum basi sepalorum magis conspicue papillatis; sepala 5, foliacea, 3—4 mm., 3—5 mm., vel 3—6 mm., longa, basi aequilata, 2—3 mm. lata; petala 2-seriata, e prope apicem inferne angustata, obtusa vel subtruncata, integra vel inconspicue emarginata vel denticulata, purpureo rosea, 6—9 mm. longa, apice 1·5 mm., vel rarius ad 2 mm., lata; staminodia diu appressa, superne attenuata, alba, ad 7 mm. longa; filamenta 4—5-seriata alba, ad 5 mm. longa, exteriora nuda, interiora medio papillata, antheris pollineque pallide luteis; glandulae conspicuae, contiguae vel subcontiguae, crenulatae; ovarii lobi distantes, obtuse compressi, vix ad 0·5 mm. elevati; stigmata 5, subulata viridia, in genere minima visa, 1—1·5 mm. longa cum cauda 0·5 mm.; capsula pallide brunnea, infra obconica, 4 mm. longa, supra per 1—1·5 mm. elevata, suturis ringentibus, 6 mm., expansa 9 mm., diam., cetera generis; semina pallide brunnea. levia, ca. 1 mm. longa.

Cape Province: in dit. Uitenhage; "2 miles E. of Uitenhage", Oct. 1960, *F. J. Stayner*. Karoo Garden 903/60. Fl. Nov. 1960—Jan. 1961.

Conophytum paupere (*Subrisa*).—Plantae ad 2 cm. altae, ad 6 cm. diam.; reliquiae senectae papyraceae, saturate brunneae novellissimae subpergamentaceae rugosaeque brunneae; corpuscula obovata vel anguste obovata, vel subobconica, basi rotundata, supra circularia convexa, sat pallide viridia, immaculata, 5—6 mm. longa, ad 5·5 mm. diam., ore depresso, margine pallidiore, utrinque obscure fossifero, 2—3 mm. longo; pedunculi ad 3 mm. longi, basi bracteati, bracteis obtusis, ad medium connatis, 1 mm. longis; calyx subherbaceus, superne roseus vel roseosuffusus, tubo 2—2·5 mm. longo, partim incluso, segmentis 4, obtusis subaequilongis, 1—1·5 mm. longis; corolla 7—8 mm. longa, tubo pallido, ad 3·5 mm. longo, segmentis ca. 22, superne angustatis, obtusis vel acutis, ad 0·5 mm., vel rarius ad 0·75 mm., latis, exterioribus ad 4·5 mm., interioribus 1·5—2 mm., longis; stamina 3-seriata, pauca, inferiora manifesta, superiora fere omnino exserta, filamentis pallidis vel superioribus cum antheris pollineque aureis; discus conspicuus, luteo viridis, segmentis 8, emarginatis; ovarium circa marginem concavum, medio dimidium altitudinis nectarii attingens; stylus nullus, stigmatibus 4, gracillimis, 1·5—2 mm. longis.

Cape Province: Namaqualand; "12 miles N. of Soebatsfontein," Nov. 1960, *H. Hall* 2183. N.B.G. 1028/60. Fl. Feb. 1961.

Trichodiadema obliquum.—Glabrum; rami 2 visi, ad 11 cm. longi, internodiis saepius 1—2 cm. longis, ad 1·5 mm. diam., ramulosi, crebre papillati, demum asperuli; partes herbaceae virides papillosae, papillis rotundatis esetiferis; folia ascendentia, supra plana obtusa, lat. visa superne vix angustata oblique obtusa vel fere subtruncata, 1·5—2·5 cm. longa, medio ad 3 mm. lata diametroque, setis apicalibus subnullis vel ad ca. 6, ad 1·5 mm. longis; pedunculi graciles, prope apicem dilatati, 1—2 cm. longi; receptaculum fere semi-globosum, ad 2·5 mm. longum, ad 6 mm. diam.; sepala 5, prope apicem recurva, 3—7 mm., vel 4—8 mm., longa, basi 2—3 mm. lata, setis apicalibus subnullis vel 1—2, ad 0·5 mm. longis; petala 4—5-seriata obtusa, exteriora e medio, vel supra, inferne angustata, 5—6 mm. longa, vix, ad 1·25 mm. lata, intima erecta vel recurva, in staminodia abeuntia; filamenta alba, staminodiis breviora, ad 3 mm. longa, exteriora basi parcissime ciliatis, interiora prope medium papillata (non bene visa), antheris pollineque luteis; glandulae distantes crenulatae; ovarii dimidium exterius planum, interius obtuse 5-lobatum; lobis distantibus, ca. ad 0·75 mm. elevatis; stigmata 5, subulata caudata, 2 mm. longa cum cauda 0·75 mm.

Cape Province: in dit. Beaufort West; Nelspoort, Oct. 1960, *F. J. Stayner*. Karoo Garden 773/61. Fl. Feb. 1961.

Astridia blanda.—Rami plures visi, ad 23 cm. longi, internodiis 1—3 cm. longis, 2—5 mm. diam., ramulosi, ramo ad paria 7 ramulorum secundorum floriferorum ferente; partes herbaceae velutinae, pallide virides, siccae pallide cinereae vel brunneae; folia ascendentia vel fere patentia, interdum sublunata, supra plana obtusa, lat. visa semi-ovalia vel fere semi-circularia, apice rotundata, obtuse carinata, ad 3·7 cm. longa, ad 1·2 cm. lata, ad 1·5 cm. diam.; flores solitarii, interdum quasi aggregati ob ramulos floriferos abbreviatos crebrosque apice rami confertos; pedunculi ad 7 mm. longi, apice bracteati, bracteis concavis, ad 5 mm. diam., complanatis late ovatis, acutis, ad 7 mm. longis, ad 8 mm. latis; receptaculum fere semi-globosum, 4 mm. longum, ad 9 mm. diam.; sepala 6 vel rarius 5, sat crassa, subovata, apice rotundata, 5 mm., vel in flore altero 6—7 mm. longa, basi 3—5 mm. et 4—7 mm. lata; petala 2—3-seriata, breviora pauca, inferne leviter, vel vix, angustata, obtusa vel intima acuminata, basi alba, deinde pallide pulchre rosea, 6—19 mm. longa, ad 1·5 mm. lata; staminodia sat pauca, apice recurva, stamina aequantia vel breviora; filamenta conice collecta, alba ca. 6-seriata, ad 6 mm. longa, exteriora prope basim ciliate papillata, intima infra medium papillata, antheris pollineque aureis; discus profunde divisus; ovarium circa marginem planum, medium versus abrupte 6-lobatum, lobis approximatis sat obtuse compressis, ad 0·75 mm. elevatis; stigmata 6, gracilia, ad 6·5 mm. longa; semina echinata.

South West Africa; locus ignotus, comm. *H. M. Holloway* 1. Fl. Jan. 1937.

THE SOUTH AFRICAN SPECIES OF AIZOACEAE

IX. *GLINUS.*

By R. S. Adamson.

The genus *Glinus*, founded by Linnaeus in 1753, contains about 13 species which occur in all the warmer zones in both hemispheres. In Africa it is found from the northern parts of the Union to the Mediterranean, also in Madagascar. It occurs in Southern Europe, in Spain, Sicily and the Balkans. Three species are recorded for South Africa.

The genus is allied to *Mollugo* with which it has been united (e.g. Ser. in DC. Prod. 1 : 391. 1824; Benth & Hook., Gen. Pl. 1 : 857. 1867) but differs in so many features that it is generally looked upon as distinct. The main differentiating features are the larger exstipulate leaves, the larger flowers with acute perianth segments, the more numerous stamens, and especially the numerous seeds with a prominent aril and a long funicle.

GLINUS L

Sp. Pl. 463. 1753; Gen. Pl. ed. 5. 208. 1754.
Rolofa Adans. Fam. Pl. 2 : 256. 1763.
Physa Thouars Gen. Nov. Madag. 20. 1806.
Tryphera Blume (1825) *fide* DC. Prodr. 13.2 : 422. 1849.
Nemallosis Rafn. Fl. Tell. 3 : 24. 1836.
Pauli-Wilhelmia Hochst. Flora 27 : 17. 1844.

Prostrate herbs. Leaves without stipules, mostly in whorls, separated by distinct internodes. Flowers, at the nodes, in cymes without a common peduncle. Perianth segments 5, free or almost so, acute or mucronate. Stamens 3—20 or more, when isomerous alternate with the perianth segments, when more often in groups and the outer sterile. Ovary superior, 3—5-chambered, with numerous ovules in each chamber; style wanting or very short, the stigmas spreading. Fruit thin-walled loculicidally dehiscent. Seeds many, reniform, with a fleshy aril and on a long funicle usually curved upwards.

The type species is *G. lotoides* L.

In the drier regions, on open sites liable to seasonal moisture, riverbeds, depressions, etc. In South Africa confined to the east coast and the northern parts.

Annual or perennial with annual shoots. Leaves basal and opposite or in unequal whorls, the basal withering at an early stage. Perianth segments green outside, often yellow inside, 3—9 mm. long. Stamens with thin flattened filaments, when numerous the outermost without anthers and often 2—3-fid at the tip. These staminodes were described as petals by some of the older writers. Seeds smooth or ridged, the ridges sometimes tuberculate. Aril white, often lobed.

KEY TO THE SPECIES.

1. Glabrous: leaves lanceolate or narrow-oblong; flowers 3—5 mm. long, pedicellate: stamens 3—10 .. .. *oppositifolius*
1. Hairy at least when young: flowers 5—9 mm. long: stamens 10—30.
  2. Hairy all over: leaves rather large, broadly obovate to subrotund, with petioles as long as the blade: flowers on very short pedicels: stamens 10—20: aril half as long as the seed *lotoides*
  2. Older parts glabrescent, the younger with stiff hairs: leaves small, oblanceolate, with short petioles: flowers on long pedicels: stamens 20—30: aril less than a third the length of the seed .. .. *bainesii*

1. **G. oppositifolius** (L.) A. DC. Bull. Herb. Boiss. 2. ser. 1 : 559. 1901.
Mollugo oppositifolia L. Sp. Pl. 89. 1753.
M. spergula L. Sp. Pl. ed. 2. 131. 1762.
M. glinoides Rich. Tent. Fl. Abyss. 1 : 48. 1847.
M. parviflora Ser. DC. Prod. 1 : 391. 1824.
M. serrulata Sond. Linnaea 23 : 15. 1850
Pharnaceum mollugo L. Mant. 2. 561. 1771 *non* Sp. Pl. ed. 2. 389. 1762.
P. oppositifolium Spreng. Syst. 1 : 949. 1825.
G. spergula (L.) Pax E. & P. Nat. Plfzf. 3 1b : 40. 1889.
G. mollugo Fenzl Ann. Wien. Mus. 1 : 359. 1834.
G. denticulatus Fenzl l.c. 361. 1834.

Glabrous or with a few appressed hairs on the youngest parts. Stems up to 50 cm. long, with internodes 1—3 cm. long. Leaves opposite or in whorls of 4—6, unequal, obovate to elliptical-oblong, 1—3 cm. long, 0·4—1 cm. wide, acute and often mucronate at the tip, at the base gradually narrowed to a short petiole, the edges entire or obscurely serrulate in the upper half. Young leaves with a few hairs on the midrib below, the older glabrous. Flowers in groups of 3—6, on pedicels 4—8 mm. long. Perianth segments 3—5 mm. long, green with a brown streak outside, white or pinkish inside, the outer flat, the inner cucullate and slightly keeled. Stamens 3—5, occasionally 10. Staminodes wanting. Stigmas 3. Seeds dark brown, with small tubercles in lines, the aril less than a third the length of the seed.

The type (Ceylon) is in herb. *Hermann* 1.fol.20. BM.

On damp open soil, in river beds, vleis, etc. Natal and Lowveld. Throughout Central Africa, in all the adjoining territories. Very variable in the size and width of the leaves. Several species and varieties have been described but they seem to intergrade completely.

NATAL.

DURBAN. *Gerrard* 585: *Gueinzius*. Umbilo, *Moss* 6657. Isipingo, *Schlechter* 2804.

TRANSVAAL.

KL. LETABA RIV. *Junod* 1251.

2. **G. lotoides** L Sp. Pl. 463. 1753; Loefl. Iter. Hisp. 145. 1759.
G. dictamnoides Burm. f. Fl. Ind. 131. 1768; L. Mant. 2.243. 1771.
Mollugo hirta Thunb. Prod. Pl. Cap. 20. 1784.
M. glinus Rich. Tent. Fl. Abyss. 1 : 48. 1847.
Pharnaceum hirtum Spreng Syst. 1 : 949. 1825.
Tryphera prostrata Blume fide. DC. Prod. 13.2 : 442. 1849.

Covered all over with rather rigid stellate and simple spreading hairs. Stems 15—50 cm. long, with internodes usually less than 1 cm. long. Lower leaves alternate, the upper in whorls of 2—4, petiolate, the blades obovate to almost orbicular, 0·5—3 cm. long, 0·5—2 cm. wide, obtuse or subacute: petioles 0·3—1·5 cm. long. Flowers solitary or more often in groups of 3—8 or more, on pedicels 1—3 mm. long. Perianth segment 3—9 mm. long, acute or mucronate, more or less keeled, the inner with broad membranous edges. Stamens 10—20 or more, rarely 3—5, the outer often without anthers. Stigmas 3 or 5. Seeds dark brown, smooth or with raised ridges, with or without tubercles, the aril about half the length of the seed.

The type is *Boccone* Icon. & Desc. Rar. Pl. Sicil. t. 11 f.B. 1674.

It is evident that in 1753 Linné knew this species only from the literature. It was fully described by Loefling, Iter. Hisp. 145. 1758, from Spain. This description was taken over in Sp. Pl. ed. 2. 663. 1762. Loefling's specimen has not been traced. In herb. Linn. there is a sheet 631.1. of a plant cultivated at Uppsala from seed supplied by Loefling. The name is often attributed to Loefling but Linné made the combination in 1753.

Throughout Central Africa, also tropical Asia, and in Australia. In Europe, in Spain, Sicily and Bulgaria.

A variable species in size, in the shape of the leaves and in the quantity of hairs. In Central Africa the species hybridises freely with *G. oppositifolius* and a large number of intermediates have been recorded. In the Union, where the areas of the two species do not overlap, such hybrids have not been noted.

(1) Var. *lotoides*.

Var. *candida* Fenzl Ann. Wien. Mus. 1 : 357. 1854.

Usually rather densely hairy and white or yellowish. Leaves with the blades obovate to suborbicular, obtuse subacute or apiculate, with the veins distinctly raised below when dry, and the petiole as long as to half as long as the blade. Flowers 1—15, most commonly 3—6 in each group. Pedicels half as long as the perianth. Perianth segments 6—8 mm. long, usually densely hairy, the outer acute, slightly keeled, shortly mucronate. Stamens 10—15, rarely 5—10: staminodes wanting or few and slender. Aril of seeds more than half the length of the seed.

Apparently confined to the northern parts of South West Africa and Northern Transvaal.

South West Africa.

Kunene Riv., *Story* 5826; Omaruru, *Strey* 2407.

Transvaal.

MESSINA *Moss* (Young) 14664.

N.B.: All the European specimens seen belong here.

(2) Var. *virens* Fenzl Ann. Wien. Mus. 1 : 357. 1834.

Var. *pubescens* Sond. Fl. Cap. 1 : 137. 1860.

Less hairy than var. *lotoides* and usually green. Leaves narrower, not more than half as wide as long, gradually cuneate below, narrowed to a subacute or acute point, the veins not projecting on the underside. Flowers in groups of 3—20 or more, most commonly 8—12. Pedicels not more than half as long as the perianth. Perianth segments 4—5 mm. long, narrowed to an acute tip, prolonged as a distinct mucro, distinctly keeled on the back. Stamens 10—15, rarely fewer or up to 20: staminodes wanting or very slender and 2-fid. Aril not more than half the length of the seed.

The type is *Drege* Gariep Riv. W. (lost) Lectotype K. Readily distinguished by the narrow leaves without projecting veins, the smaller flowers, and the perianth segments with more pronounced keels and extended points.

SOUTH WEST AFRICA. Okavango, *de Winter* 3974; Okahandja, *Dinter* 301; Windhoek, *Moss* 18055.

Cape.

NAMAQUALAND. Orange Riv., *Drege*; Henkries, *Schlechter*.

CALVINIA. Lockerberg *Acocks* 19196.

KIMBERLEY. Shaw's Drift, *Acocks* 2569.
BARKLY WEST. Warrenton, *Acocks* ~~15196.~~

TRANSVAAL.

ZOUTPANSBERG. Messina, *Moss & Rogers* 57, 67a; Pafuri Riv., *Codd & Dyer* 4630.

PRETORIA. Aapies Riv., *Burke: Zeyher* 612.

In South West Africa there occur specimens which have the vegetative features of var. *lotoides* but the flowers and perianth of var. *virens*. These are probably hybrids between the two varieties, e.g. Waterberg, *Bradfield* 301.

In Central Africa var. *lotoides* seems to be the commoner and more widespread form. Var. *virens* occurs as far north as Tanganyika but is not recorded from Northern Africa.

3. **G. bainesii** (Oliv.) Pax in E. & P. Nat. Pflzf. 3.1b 40. 1889.
Mollugo bainesii Oliv. Fl. Trop. Afr. 2; 590. 1871.

A more rigid plant than the other species, the young parts covered with spreading hairs and short straight prickles, the older glabrescent. Stems rather stout, pale-coloured, grooved, sparsely branched, up to 40 cm. long. Leaves small, in distant or rarely close whorls of 3, oblanceolate, 0·5—1·5 cm. long, 0·3—0·5 cm. wide, acute or mucronate at the tip, gradually narrowed at the base to a short petiole: the veins not visible except a slightly raised midrib below. Leaves usually with some hairs or prickles on the midrib below and occasionally on the edges which are slightly revolute when dry. Petioles with prickles at the base. Flowers in groups of 3—9, most commonly 6. Pedicels short at first but lengthening at the fruiting stage to 0·8—2 cm., usually with some hairs or prickles. Perianth segments 7—8 mm. long, the outer acute, mucronate with hairs or prickles on the back, the inner with broad membranous margins. Stamens 20—30, usually with some simple or 3-fid staminodes. Stigmas 3. Seeds brown, with smooth or obtusely tuberculate ridges: aril small.

The type is *Baines* s.n. (Kwebe) K.

Seasonally damp sand in Portuguese East Africa, S. Rhodesia, Bechuanaland to Angola. In S. Africa restricted to the Northern Transvaal.

TRANSVAAL.

ZOUTPANSBERG. Messina *Rogers* 19399a; *Moss* (Young) 18391.

WATERBERG. Ellisons, *Codd* 8491; Tamboetie Riv., *Meeuse & Strey* 10446.

POTGIETERSRUST. Doornpoort, *Meeuse* 9552, 9552a.

A very distinctive species known by the small leaves, large flowers on long pedicels in the later stages, the numerous stamens, and seeds with a small aril. Rather variable in the quantity of hairs and prickles.

THE SOUTH AFRICAN SPECIES OF AIZOACEAE.

X. *GISEKIA* L.

By R. S. Adamson.

The small genus *Gisekia* occurs throughout Central Africa and the warmer parts of Asia. The real systematic position of the genus has been the subject of much discussion. While it agrees with other members of Aizoaceae in habit, inflorescence and general floral structure, it diverges in having an apocarpus gynaecium, on account of which it has often been referred to Phytolaccaceae. This was the view taken by Sonder, Fl. Cap. 1 : 155. 1860, and more recently by Heimerl in E. & P. Nat. Plf. 3. 1b.11. 1889, and by Phillips Gen. S.Afr. Pl. ed. 2.285. 1954. Against this Walter, Das Pflr. 4.83. 24. 1909, in his monograph on Phytolaccaceae definitely excludes the genus from that family. Bentham & Hooker, Gen. Pl. 1 : 859. 1867, regard it as belonging to Aizoaceae (Ficoideae) and this arrangement has been followed by Pax & Hoffmann, E. & P. ed. 2. 16c. 192. 1934, also by Hutchinson, Fam. Fl. Pl. ed. 1. 125, 1926, do. ed. 2. 429. 1959, and by Friedrich, Mitt. Bot. Munch. 12 : 58. 1955. The last two refer the genus to Molluginaceae which is treated as a separate family. Gagnepain, Bull. Bot. Soc. Fr. 65 : 17. 1918, advocated its transfer to Portulacaceae. His view has not received much support.

The genus is probably most nearly related to *Limeum* though the affinity is not very close. The schizocarpic fruit of *Limeum* may represent a development along lines that culminated in apocarpy in *Gisekia*. The curious dehiscence of the fruit of *Corbichonia* may be the result of a similar tendency towards carpel separation but along quite distinct lines.

GISEKIA

L. Mant. 2 : 554. 1771.

Koelreutera Murr. Nov. Comm. Gott. 3 : 67. t2. fl. 1772.

Miltus Lour. Fl. Coch. 1 : 363. 1790.

Herbs usually prostrate or sprawling, annual or with annual shoots. Leaves mostly opposite, often unequal, generally fasciculate, without stipules, separated by distinct internodes. Inflorescences terminal or at the nodes, cymose, often umbellate, often with two main branches, with or without a common peduncle. Flowers small, bisexual or less often unisexual. Perianth segments free, 3-veined, white yellowish or red inside. Stamens 5—15 or more, situated at the edges of a flattened disc when isomerous alternate with the perianth segments. Ovary superior, of 5, or less often 3 or 10, carpels, each with one ovule, united at the centre only and soon separating: style on the inner edge of each carpel. Fruit of 5 achenes, usually muricate. Seeds black, swollen-reniform.

The type species is *G. pharnacioides* L.

The generic name has been variously spelt by different authors: *Giesekia, Gieseckia, Giseckia, Gisechia, Giesechia.*

A very uniform genus in habit. Stems many from the root. Glabrous or nearly so but often with minute hairs at the nodes and on the inflorescence. Leaves slightly succulent, pale or white below owing to white wart-like structures, either dots or more often linear streaks up to 0·25 mm. long. In the dry state these warts are slightly raised and hard. The inflorescence is few- or many-flowered and with or without a peduncle.

Sonder, Fl. Cap. 1 : 155. 1860, described three species but here they are reduced to two, both of which are very variable. It is not possible to carry out segregation until more detailed work on cultivation, genetics and cytology has been undertaken.

KEY TO THE SPECIES.

1. Stamens 5: flowers on equal pedicels not extending at anthesis, opening together: perianth white or yellow .. .. .. 1. *pharnacioides*
1 Stamens 10—15: pedicels lengthening at anthesis: flowers opening in succession: perianth often red .. .. .. 2. *africana*

1. **G. pharnacioides** L Mant. 2. 562. 1771.

Koelreutera molluginoides Murr. Nov. Comm. Gott. 3 : 67. 1773.

G. molluginoides Wight Calc. J. Nat. Hist. 17 : 162. 1847.

G. congesta Moq. in DC. Prod. 13.2 : 28. 1849.

Shoots prostrate, 10—80 cm. long, with internodes 2—7 cm. long and distant branches. Stems pale-coloured, terete or with short decurrent ridges below the leaves. Leaves mostly rather dark green above, whitish below, petiolate: blades linear, linear-oblong or oblanceolate, 1—5 cm. long, most commonly 2—3, 0·2—0·7 cm. wide, rounded at the tip or sometimes mucronate, at the base cuneate, the edges smooth, slightly revolute when dry, the midrib slightly projecting below. Petioles 0·3—0·5 cm. long, channelled above, usually with a few hairs on the edges. Inflorescence umbellate or often almost hemispherical, sessile or with a peduncle 0·5—2 cm. long, often with 2 main branches. Flowers few or many, with equal pedicels 2—4 mm. long opening simultaneously. Perianth segments 0·5—2·5 mm. long, rarely up to 3·5 mm., white, yellow or occasionally red inside, with membranous edges, the outer acute, the inner broad, obtuse, cucullate, often with a mucro behind the tip. Stamens 5, the filaments dilated at the base. Fruit dark-coloured, rather densely covered with warts.

The type appears to be lost. In herb. *Linn.* there are two sheets (399. 1 & 2) of plants cultivated in the garden at Uppsala. As neotype a specimen in herb. *Montini* (S) is selected. This was sent by Banks in 1760. It is labelled "Ind. Or." which is the only habitat given by Linnaeus, and agrees fully with the cultivated specimens in herb. *Linn.*

The original spelling "*pharnacioides*" is used in preference to the more usual "*pharnaceoides*".

Variable in size, leaf-shape, length of the peduncle, and number and closeness of the flowers. *G. congesta* Moq. is merely a form with a many-flowered pedunculate inflorescence.

Open sites in rather dry regions. Mostly in the northern parts but extending to the eastern Karoo.

SOUTH WEST AFRICA. Lüderitz, *Hobart-Hampden* 16; Keetmanshoop, *Hobart-Hampden* 15; Gt. Karasberg, *Pearson* 8579; Gobes, *Pearson* 3742. Damaraland, *Een.*

CAPE.

VRYBURG. Vryburg, *Rodin* 3512 (p.pte.).

PRIESKA. Prieska, *Bryant* 1038, 1039.

KIMBERLEY. Kimberley, *Wilman.* K35; Modder Riv., *O. Kuntze; Silk* 194.

CARNARVON. Carnarvon, *Theron* 1637.

GRAAFF-REINET. Kendrew, *Galpin* 10062; Graaff-Reinet, *Bolus* 71.

MIDDELBURG. Grootfontein, *Theron* 443.

CRADOCK. Rietfontein, *Galpin* 5650.

QUEENSTOWN. Shiloh, *Baur* 902; Albert, *Cooper* 1349.

ORANGE FREE STATE.

WINBURG. Gedara, *Zeyher* 50; Rouxville, Caledon Riv., *Burke* 310; *Zeyher* 624; s.l. *Barber.*

TRANSVAAL.

ZOUTPANSBERG. Zoutpan, *Schweickerdt & Verdoorn* 545; west of Louis Trichardt, *Schlieben* 7544;

LETABA. Olifants Riv., *M. Moss* 18841;

WATERBERG. Klipheuvel, *Breyer*; Palala Riv., *Smuts & Gillet* 3337; Naboomspruit, *Galpin* M734.

POTGIETERSRUST. Potgietersrust, *Leendertz* 1276.

RUSTENBURG. Rustenburg, *Nation* 161; Magaliesberg *Burke; Mogg;*

PRETORIA. Wonderboom, *Thode* A425; Wilge Riv., *Schlechter* 3747; Onderstepoort, *C. A. Smith;*

NELSPRUIT. Pretorius Kop, *Codd & de Winter* 4913;

MARICO. Zeerust, *Thode* A1411.

NATAL.

ZULULAND. False Bay, *Gerrard* 1452.

Without locality:—*Harvey; Drege* 6228.

N.B. In many localities, especially the more southern, the species is recorded only from disturbed ground where it may be adventive rather than truly indigenous.

2. **G. africana** (Lour.) O. Kuntze Rev. Gen. 3.2 : 108. 1898.
Miltus africana Lour. Fl. Cochin. 1 : 302. 1790.
G. miltus Fenzl Nov. Stirp. Dec. Vind. 10 : 86. 1839.
G. pentadecandra E. Mey. ex Moq. in DC. Prodr. 13.2 : 28. 1849.
G. aspera Klotysch in Peters Reise Mozamb. Bot. 139. 1862.
Glinus mozambicensis Spreng. Syst. 2 : 467. 1825.

Very often tinged with red. Stem 5—50 cm. long, with internodes 2—8 cm. long, glabrous or with short muricate hairs at the nodes. Stems more or less ridged especially when dry. Leaves rather pale green above, whitish below, petiolate; blades linear, linear-oblong, oblong or obovate, 1—5 cm. long, 0·2—0·5 cm. wide, cuneate, the edges flat or slightly revolute. Petioles 0·2—0·5 cm. long. The upper leaves smaller and often alternate. Inflorescences often numerous at the branch tips, with or without a peduncle, usually with two main branches, sometimes nearly spherical. Flowers few or many, opening in succession, umbellate at least at the branch tips, very often red. Peduncles up to 5 cm. long, the main branches up to 3 cm., the pedicels short at first but lengthening to 0·3—0·8 cm. Perianth segments 2—4 mm. long, with red or white membranous margins, obtuse or subacute, the inner broader but flat when the flower opens. Stamens 10—15, rarely 8, occasionally 20 or more, some in pairs or groups of 3. Carpels rarely 10. Fruit as in *G. pharnacioides.*

Loureiro's type specimen appears to be lost. As neotype is selected a more or less contemporary specimen from the type locality "Mozambique" collected by *Forbes* (BM. co.K., TCD). This agrees well with the original description except that it is a small plant, 25—30 cm., instead of "4-pedales longus".

Open places in the northern districts. Throughout Central Africa south of the Sahara.

Very variable in size, in the form of the inflorescence, and the length of the peduncle. Two principal varieties are distinguishable:

Var. 1. *africana*.

Inflorescence umbellate or if lax with umbellate groups of flowers, if dense often hemispherical, usually with two main branches. Flowers most often red, few or more commonly numerous. Perianth segments 2—3 mm. long.

This variety includes a number of forms of which the extremes may look very distinct but which are connected by intermediates. Pending more detailed experimental work these forms cannot be given exact status. The more apparent are:

(1) Inflorescence umbellate, most commonly many-flowered, often hemispherical, with or without a peduncle. The typical form.

(2) Inflorescence lax, cymose, the flowers distant or close, in threes on the ultimate branches. Inflorescence more or less flat-topped. Dry regions especially in the west.

(3) Inflorescences few, 3—7-flowered, on a long peduncle, the flowers distant, pedicellate. Leaves linear.

(4) Large plants with large leaves. Inflorescences at the nodes, few, 5—9-flowered. In the more tropical regions.

(5) Small. Leaves small, broad, sometimes almost rotund. Inflorescences at the nodes, few-flowered, without a peduncle. In damp or sheltered sites.

SOUTH WEST AFRICA. Okavango, *de Winter* 4135; Omuramba Mpungo, *de Winter* 3901; Okahandja, *Dinter* 186, 5146; Usakos, *Lindney*; Windhoek, *Jordan* 37; Rehoboth, *Strey* 2523-4; Outjo, *de Winter & Leistner* 5146; Haris, *Pearson* 9511; Sabiesis, *Pearson* 4599; Heikamschab, *Galpin & Pearson* 7464; Seekeim, *Pearson* 3737; Sandvernaar, *Pearson* 4681; Narudas Sud, *Pearson* 8580; Klein Karas, *Ortendal* 91; Gt. Fish Riv., *Pearson* 9700; Ramans Drift, *Pearson* 4062; Damaraland *Een*; *Pearson* 2892, 4284; *Rogers* 15259; *Worsdell*.

CAPE.

NAMAQUALAND. Wortel, *Pearson* 3618.

PRIESKA. Prieska, *Acocks* 12642; *Bryant* J196, 220, J220, 1038.

HAY. Griquatown, *Burchell* 1973; Orange Riv., *Burchell* 2107.

KIMBERLEY. Kimberley, *Wilman* K38.

TRANSVAAL.

ZOUTPANSBERG. Messina, *Rogers* 20018; Pafuri Riv., *Obermeyer* 670; s.l. *Smuts & Gillett* 4120.

PIETERSBURG. Silwane's Location, *Breyer*.

WATERBERG. Klipheuvel, *Breyer*; Nylstroom, *Nelson* 291.

RUSTENBURG. Magaliesberg, *Worsdell.*

PRETORIA. Onderstepoort, *C. A. Smith* 6064; Matsaba, *Schlechter* 4575; Klippan, *Rehmann* 5194.

WITBANK. Wilge Riv., *Schlechter* 3747.

NELSPRUIT. Komatipoort, *Kirk* 69; *Rogers* 845; Skukuza, *Codd & de Winter* 4999.

NATAL.

ZULULAND. False Bay, *Gerstner* 5221.

Without locality:—*Drege* (*G. pentadecandra* E.M.).

Var. 2. *cymosa* Adamson var. nov.

Var. *pedunculata* (Oliv.) Brenan Mem. N.Y. Bot. Gds. 85 : 444. 1954. *p.pte.*

G. miltus var. *pedunculata* Oliv. Fl. Trop. Afr. 2 : 594. 1871. *p.pte.*

A typo differt caulibus longioribus, foliis inferioribus majoribus superioribus minoribus alternis, inflorescentiis aphyllis dichotomis, ramis et pedicellis perlongis ultimis racemiformibus, floribus magnis distantibus.

Stems up to 2 m. long, with internodes 2—18 cm. long. Leaves oblong, usually not white below, the lower 2·5—4 cm. long by 0·3—1·5 cm. wide, the upper much smaller and alternate. Inflorescence terminal and at the uppermost nodes, 10—35 cm. long, forking 3—4 times, the branches 2—7 cm. long, the ultimate pseudoracemose. Peduncle 3—7 cm. long. Pedicels slender, occasionally up to 2 cm. long. Flowers well separated. Perianth segments 3—5 mm. long, pink or white inside. Stamens 10—15 or more. Carpels often more than 5.

The type is *Schlechter* 11631 BM. co-type K.

In the lower and warmer parts on the east side of the continent, from Portuguese East Africa northwards to Tanganyika and Zanzibar.

Flowers sometimes dioecious. Inflorescence much exceeding the leaves, either regularly dichasial or with two or more branch systems. This has usually been referred to "var. *pedunculata*" but Oliver's original description is very short and covers a large range of forms. As the specimens he quotes both belong to var. *africana*, the name is not available. Burtt-Davy, Man. Fl. Pl. Tvl. 1 : 53. 1926, suggested that this variety might be the plant originally collected by Loureiro. Except in size, Loureiro's description does not fit well. Further, all the earlier specimens seen belong to var. *africana*. The name "var. *Schlechteri*" has been written on sheets but there is no description.

TRANSVAAL.

ZOUTPANSBERG. Messina, *Rogers* 19488; Dongola, *Pole-Evans* 4466; Wylies Poort, *Rodin* 4227; nr. Louis Trichardt, *Schlieben* 7394;

WATERBERG. Rooikop, *Pole-Evans* 1240; *Smuts* 366;
LETABA. Sand River, *v. d. Schijff* 2201; Olifants Riv., *M. Moss* 18844;
NELSPRUIT. Komatipoort, *Rogers* 845.

THE AGE OF WELWITSCHIA BAINESII (HOOK. f) CARR.: C14 RESEARCH.

by H. **Herre**

(With Plate XVII)

(*University Botanic Garden, Stellenbosch*)

With the kind assistance of Mr. E. Jensen of Walvis Bay, I was fortunate enough to receive an old remnant of a Welwitschia plant from Heikamgab near Swakopmund during the second half of 1958. The oldest part was sent to the United States of America for a radiocarbonic C14 test to estimate the age of this particular plant. As Welwitschia does not form rings which can be counted, it is not possible to estimate its age by this means. With the kind assistance of the National Geographical Society, Washington, D.C., I was referred to the Director of the Production Research Division of the Humble Oil and Refining Company at Houston, Texas, who was willing to undertake this work free of charge in the service of science. For this I would like to convey my most sincere thanks.

For the purpose of comparison they asked for another piece of which the age was known to us, and I sent them a small plant of 15 years of age which we had raised from seed and which had died. In addition, Professor Elso S. Barghoorn of Harvard University was able to supply more parts and thus the research could be started. The result became known in February, 1960, the age of the plant being given as about 500—600 years.

As our photograph shows (Fig. 1), one part of the plant is still alive while most of it is dead. Of these dead parts one half was sent to the Botany Department of the University of Stellenbosch while the other part is exhibited in the Museum in Swakopmund, S.W.A. The living part still flourishes.

The plant shown in our second photograph (Fig. 2) may well be about 2,000 years old.

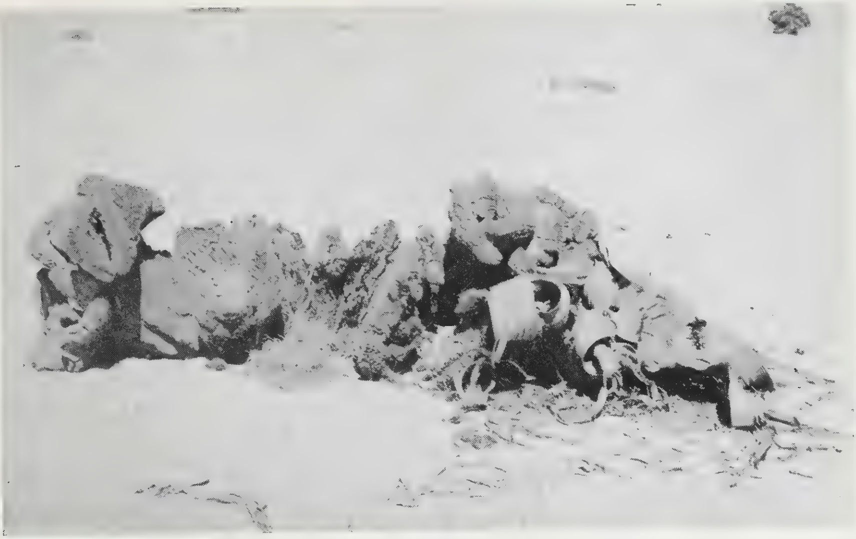

Fig. 1.

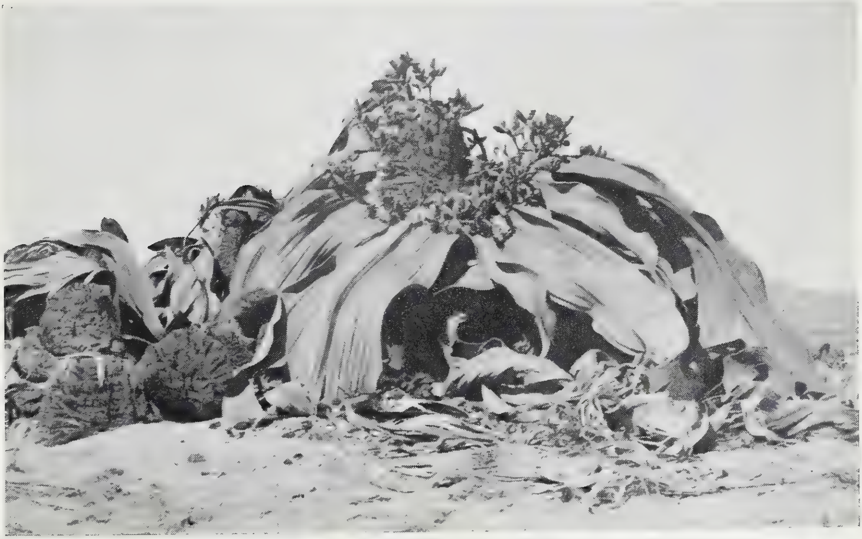

Fig. 2.

Plate XVII. *Welwitschia bainesii* (Hook. *f.*) Carr.
Fig. 1.— Plant in Namib Desert. Part of it is still alive.
Fig. 2.—Possibly the largest living plant, about 2,000 years of age.
(*Photos: E. Jensen, Walvis Bay, S.W.A.*)

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LEAF ANATOMY IN CERTAIN STRAINS OF ERAGROSTIS (BEAUV.)

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(With Plates XVIII—XXI.)

ABSTRACT

Five species of Eragrostis were found to show differences in leaf anatomy. Morphologically the species *E. curvula* could be subdivided into five types, while anatomically it was possible to distinguish two groups.

INTRODUCTION

Eragrostis curvula includes strains previously known as *E. chloromelas* and *E. robusta*. After a careful study of the strains known collectively under the name *E. curvula* it has been found possible to group them into five main types. This classification is based primarily on such characters as leaf colour, morphology, inflorescence size and structure, and general growth habit. Although the plants are influenced by growth and fertilizer treatment, the results of further studies (cytology, fertilizer response, weed encroachment, palatability, hay and nutrient yields) tend to support this classification. The types have been named *curvula, chloromelas, robusta blue, robusta intermediate* and *robusta green*. Their morphological characteristics may be summarized as follows:—

1. Robusta blue: broad blue-green leaves, stalkiness resulting in a coarse appearance, tendency towards a decumbent habit, long culm leaves making up a large proportion of the herbage, tall thick culms and large inflorescences.

2. Robusta green: broad, shiny dark green leaves, fewer stalks in comparison with robusta blue, short culm leaves making up only a small portion of the leaf material, and slender culms of medium height.
3. Robusta intermediate: abaxial leaf surface more blue of colour than the adaxial surface, leaves broad and culm leaves short, making up only a small part of the total herbage.
4. Curvula: typical "weeping" habit, long, narrow green leaves and a great predominance of leaf over stalk.
5. Chloromelas: short blue-green leaves with typically curled dead extremities, short flowering culms and finely branched inflorescences.

From time to time, workers have used leaf anatomy as an anatomical character in grasses. It has been shown that large divisions may be distinguished by characteristics of the epidermal elements, such as the presence or absence of hairs, types of silica cells, etc. (Prat 1932, 1936). Genera and species may be separated by studying the arrangement of these elements (Prat 1959). Avdulov (1931) has shown that two distinct types of chloroplasts may occur, while Esau (1953) and Eames and MacDaniels (1951) have demonstrated that differences may occur in the bundle sheaths.

Eragrostis teff, *E. capensis*, *E. plana* and *E. sp.* (collected at Melsetter, Southern Rhodesia) were studied in order to determine whether there was variation in their leaf anatomy, and the same was done for the five types of *E. curvula* described above. Specimens of these grasses are lodged in the Moss Herbarium of the University of the Witwatersrand.

METHODS

Leaves were placed in formalin-aceto-alcohol (F.A.A.) for twenty-four hours, after which they were transferred into 70% ethyl alcohol and stored until needed.

To soften the epidermis and facilitate its removal leaves were placed in a 1 : 1 mixture of pure glycerol and 70% ethyl alcohol for a minimum of 8 hours (Prat 1948). (Treatment in the above fluid should not be continued too long since this makes the material too transparent). Preparations of both the abaxial and adaxial surfaces were made, and mounted in glycerol. Some were tested for silicon with phenol and for cork with iodine, using the methods described by Johansen (1940). (Before phenol is used for silicon staining, it is beneficial to allow the crystals to become pink by leaving them exposed to the air for a few days). Others were left unstained.

Sections 10 to 20 μ thick were cut 1·0—1·5 cm. above the ligule with a freezing microtome and mounted in glycerine jelly.

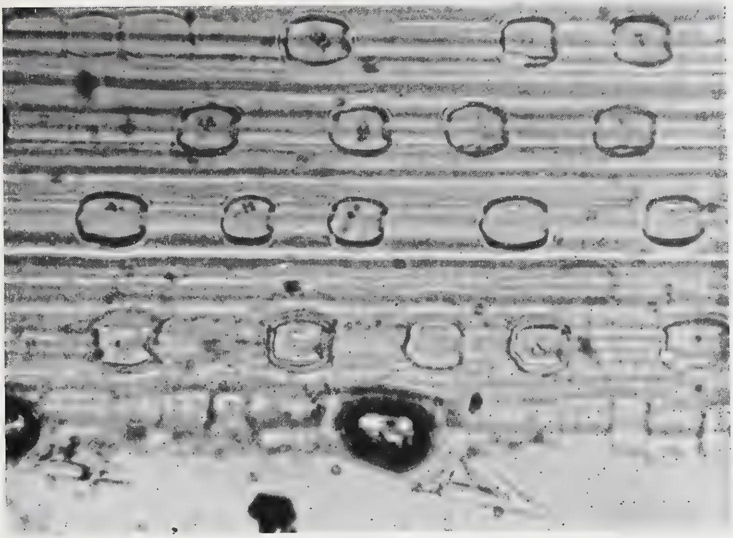


Fig. 1.

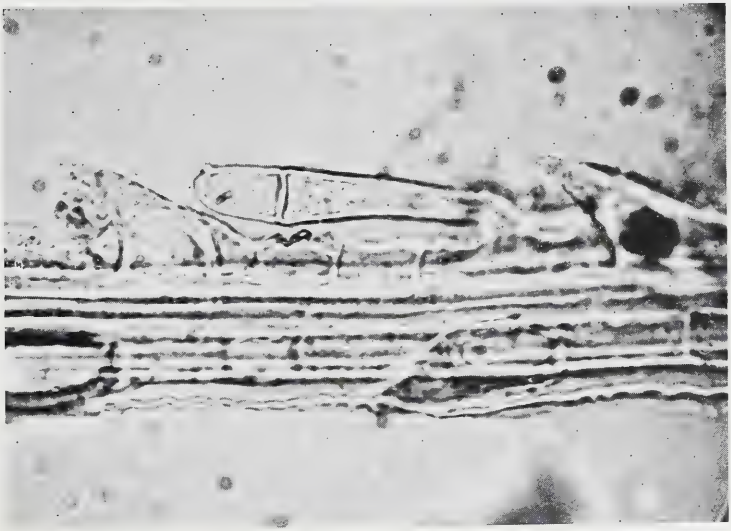


Fig. 2.

Plate XVIII

Figure 1. Adaxial epidermis of *E. robusta* (robusta blue) showing phenol stained silica cells and teeth. Magn. X 968.

Figure 2. Adaxial epidermis of *E. curvula* (No. 10 Tanganyika strain) showing teeth, bicellular hairs and epidermal cells. Magn. X 968.

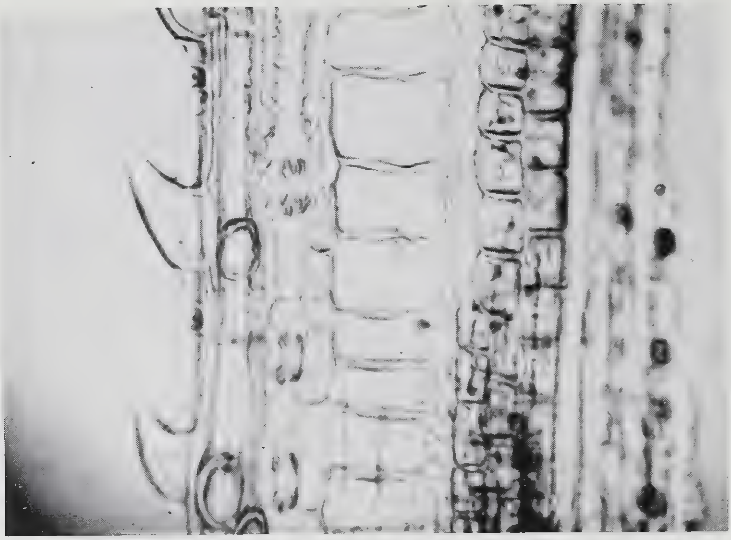


Fig. 1.

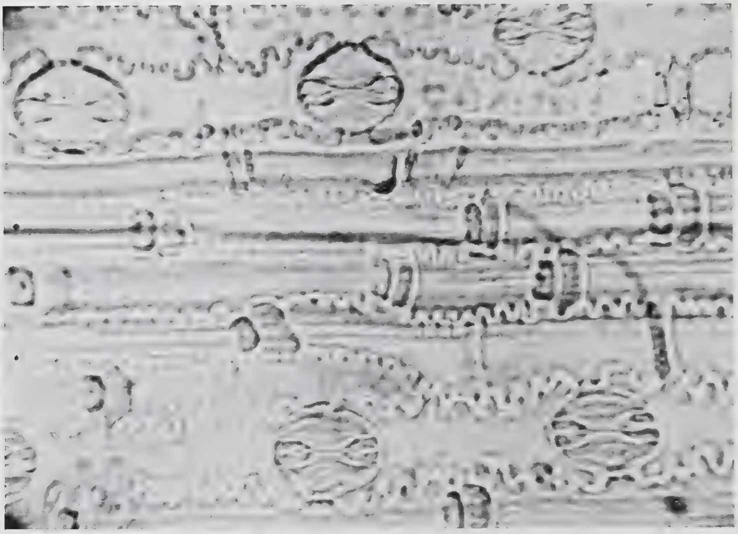


Fig. 2.

Plate XIX

Figure 1. Adaxial epidermis of *E. chloromelas* (No. 79) showing teeth, stomata, motor and epidermal cells. Magn. X 968.

Figure 2. Adaxial epidermis of *E. plana* (No. 5 Northan) showing long epidermal cells, shorter cells between the stomata, silica cells and cork cells. Magn. X 968.

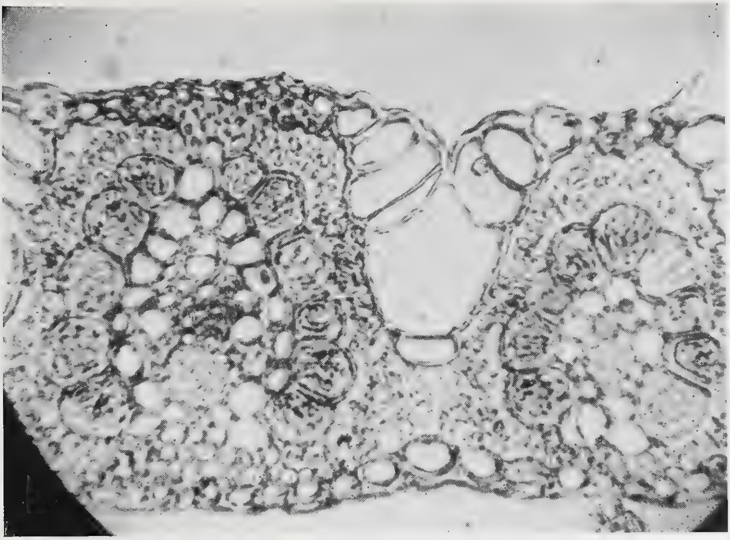


Fig. 1.

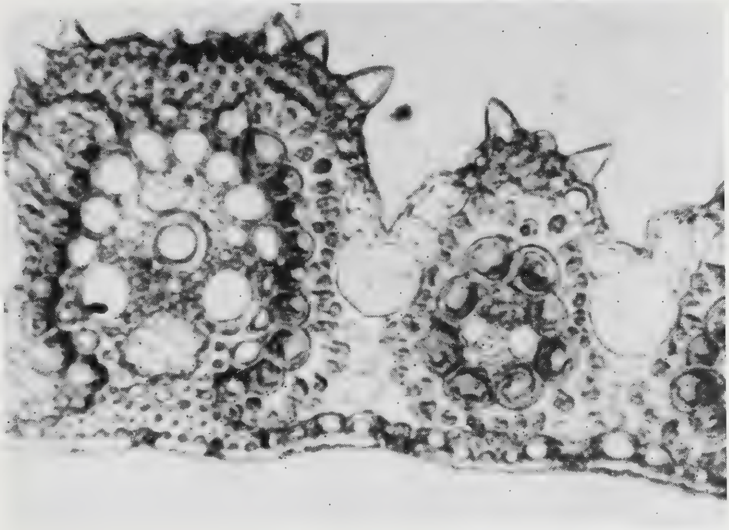


Fig. 2.

Plate XX.

Figure 1. Leaf section of *E. capensis*. Magn. X 563.

Figure 2. Leaf section of *E. teff*. Magn. X 563.

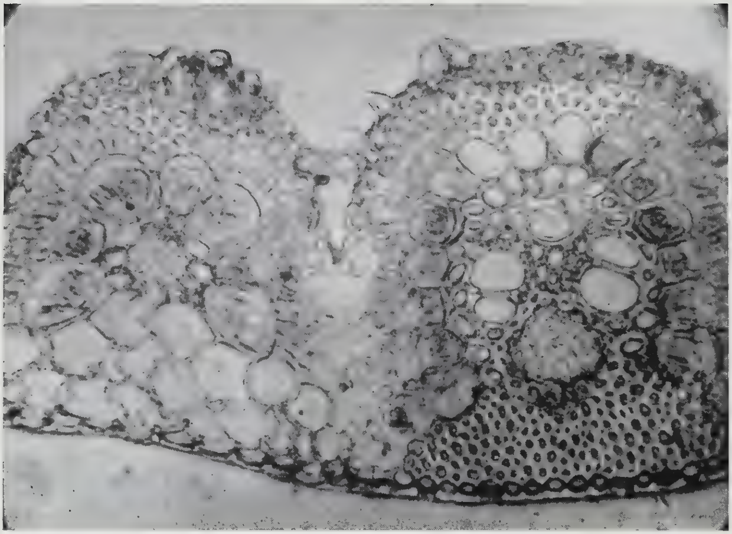


Fig. 1.

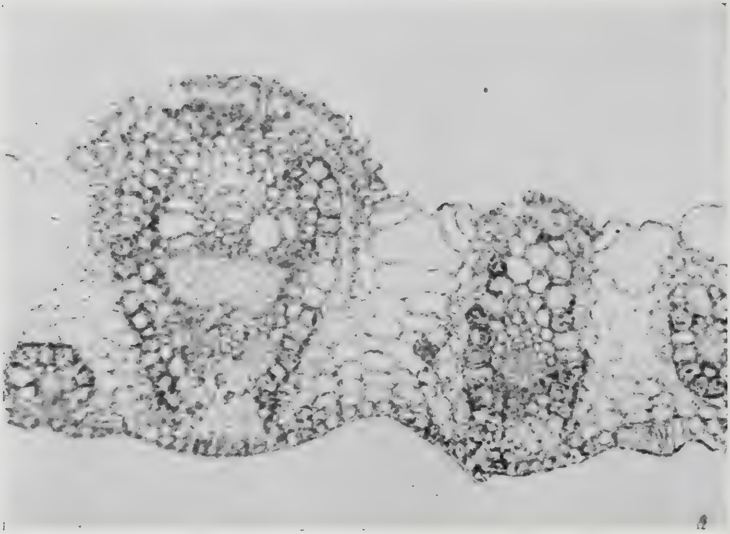


Fig. 2.

Plate XXI

Figure 1. Leaf section of *E. plana* No. 5 (Northan). Magn. X 563.

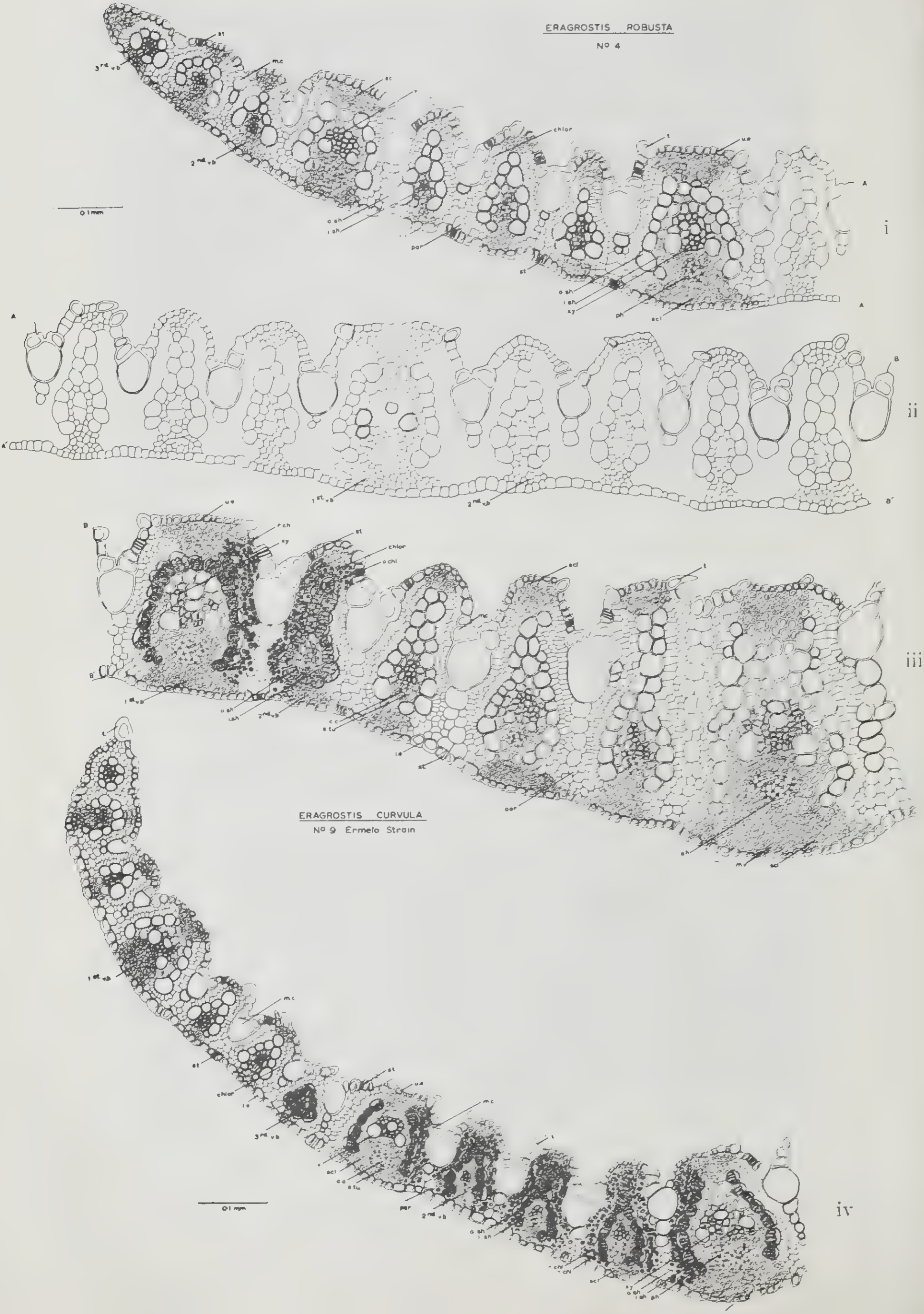
Figure 2. Leaf section of *E. sp.* Magn. X 563.

RESULTS

In all the specimens studied the epidermis showed a complex structure as is typical of the Gramineae, viz.: long cells and two kinds of short cells: silica and cork cells, which occurred in pairs. The silica cells were always hatchet-shaped (Plate XVIII, Fig. 1). Some short cells had developed protrusions in the form of short clavate bicellular hairs (Plate XVIII, Fig. 2) and others developed bulbose silicified teeth (Plate XVIII, Fig. 2 and Plate XIX, Fig. 1.) *E. sp.* showed the formation of long hairs with pointed apices in addition.

The epidermal cells were arranged in parallel rows, but the composition of these rows varied in different parts of the leaf. The basal region of the adaxial surface of the leaf sheath had a homogeneous epidermis composed of long cells only. Elsewhere in the leaves various combinations of the different cell types, mentioned above, were found. In the adaxial epidermis motor cells, epidermal cells and stomata were found in between the veins (Plate XIX, Fig. 1), while elongated cells combined with cork and silica cells occurred above the veins. In surface view the motor cells had smooth, thin walls and were rectangular in shape. Stomata occurred adjacent to these motor cells. Three to five parallel rows of teeth were found above each vein; their shape varied in the different species. In *E. capensis* and *E. sp.* they were short and straight, while in *E. curvula*, *E. plana* and *E. teff* they were slightly recurved. In the abaxial epidermis the cells between the nerves were ripple-walled, rectangular in shape and interrupted at intervals by stomata and solitary cork cells, or by cork and silica cells (Plate XIX, Fig. 2). In *E. curvula* types the differences were quantitative rather than qualitative.

The internal leaf anatomy of all the *Eragrostis* species and strains followed the same basic pattern. In certain strains first-, second- and one or two third-order vascular bundles were present, while in others only first- and third-order bundles occurred. Two sheath layers surrounding each vascular bundle were found. In all cases the outer sheath was well developed and contained large chloroplasts arranged in the form of a fan (Fig. 1, iii and iv). The internal sheath was of thick-walled sclerenchyma and was present in all vascular bundles. The outer sheath layer was surrounded by elongated, parenchyma cells which contained small, round chloroplasts. Each vascular bundle was separated from the neighbouring bundles by large parenchyma cells without chloroplasts. The motor cells were bigger than the ordinary epidermal cells and were arranged in rows extending throughout the length of the leaf upon its upper surface. They frequently occurred at the bottom of well defined grooves. Next to the groups of motor cells were cell types transitional between typical motor cells and the ordinary epidermal cells.


ERAGROSTIS ROBUSTA
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ERAGROSTIS CURVULA
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iv
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In the *E. curvula* strains studied two groups of anatomical arrangements were found. Camera lucida drawings made of these are shown in Fig. 1, i, ii, iii and iv, and the features are summarised below.

Leaf Anatomy in Certain Strains of Eragrostis (Beauv).———

Group 1 (Fig. 1, i, ii and iii). Found in robusta blue, robusta intermediate and robusta green; leaves broad and with a basic pattern of three or four second-order vascular bundles situated between two first-order bundles repeating itself approximately eight times along the breadth of the leaf; first-order bundles broad and the adaxial epidermal surface above these bundles flat; motor cells in depressions between the bundles, as found in all *E. curvula* strains; mid-vein usually a single bundle, but nearer ligule two third-order bundles could be found on either side.

Group II (Fig. 1, iv). Found in curvula and chloromelas; leaves narrow and with approximately four repeating units, smaller bundles with fewer cells as compared to Group 1 and adaxial epidermal surface above the bundles rounded.

The anatomical features of the other four species were as follows:—

E. capensis (Plate XX, Fig. 1). Leaves broad with many first- and third-order vascular bundles, mid-vein simple, usually three third-order bundles situated between two first-order bundles, little sclerenchyma, motor cells not sunken and adaxial leaf surface even.

E. teff (Plate XX, Fig. 2). Leaves broad, mid-rib region thick and made up of a number of bundles above which there were several layers of parenchyma, three or four third-order bundles situated between two first-order bundles, first-order bundles larger than third-order bundles, motor cells sunken, uneven adaxial surface, adaxial epidermal surface above third-order veins rounded and little sclerenchyma.

E. plana (Plate XXI, Fig. 1). Leaves of moderate width, mid-rib region made up of seven bundles arranged in the shape of a 'U' with enclosed portion between arms of the 'U' filled with parenchyma, large broad first- and third-order bundles alternated

---

FIGURE 1

i, ii, AND iii. *Eragrostis robusta* No. 4.

vi. *Eragrostis curvula* No. 9, Ermelo stra. in m.v. mid-vein; 1st v.b. first-order vascular bundle; 2nd v.b. second-order vascular bundle; 3rd v.b. third-order vascular bundle; ph. phloem; cc. companion cell; s. tu. sieve tube; xy. xylem; v. vessel; scl. sclerenchyma; par. parenchyma; chlor. chlorenchyma; o. sh. outer bundle sheath; i. sh. inner bundle sheath; st. stoma; t. tooth; u.e. upper epidermis; l.e. lower epidermis; m.c. motor cell; r.chl. round chloroplasts; o.chl. oblong chloro-plasts.

The distribution of chloroplasts is indicated in certain regions only.

with one another in the remainder of the leaf, motor cells sunken and comparatively small, adaxial epidermal surface above bundles rounded, and with large parenchyma cells beneath third-order bundles.

E. sp. (Plate XXI, Fig. 2). Arrangements of the first-, second- and third-order bundles variable, first-order bundles large and pear-shaped with the broader side uppermost and projecting beyond the general level of the second-order bundles, motor cells more numerous and vascular bundles separated by broader zones of parenchyma than in the other species.

CONCLUSIONS

The leaves of each species possessed characteristic anatomical features. In *E. curvula* two groups of anatomical arrangements were found, represented by robusta blue, robusta intermediate and robusta green types, and the curvula and chloromelas types respectively. The differences between these two groups occurred in the number of vascular bundles present, this being correlated with leaf size, the number of cells making up each vascular bundle and other associated tissues, and the shape of the adaxial epidermal surfaces above the vascular bundles. As qualitative differences were not found between all five types of *E. curvula*, the use of anatomical features as a method of separating these types is not practical.

ACKNOWLEDGEMENTS

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THE SOUTH AFRICAN SPECIES OF AIZOACEAE

XI. *PLINTHUS*

By

R. S. ADAMSON.

The endemic genus *Plinthus*, which is allied to *Galenia*, is confined to dry regions in South West Africa and the N.W. and N. parts of the Cape Province. A few species occur in the Transvaal and Orange Free State. The genus is one that has been little collected and is poorly represented in collections. All the species are found in rather remote and little visited regions. They are inconspicuous and rarely occur in quantity, and as a result have not received much attention. Even now neither the taxonomy nor the recorded range of occurrence can be regarded as at all complete or satisfactory. Pending more detailed field work, any scheme must be largely tentative.

The genus was founded by Fenzl, Ann. Wien. Mus. 2: 288. 1841, for the single species *P. cryptocarpus*. It was not till 1913 that two other species were described, Bot. Jahrb. 48: 499. 1913. In 1941, a century after its foundation, Verdoorn, Bothalia 4: 177, revised the genus and raised the number of species to five. Her account is followed for the most part.

PLINTHUS.

Fenzl. Ann. Wien. Mus. 2: 288. 1841; *emend.* Verdoorn Bothalia 4: 177. 1941.

Erect, decumbent or sprawling woody undershrubs, the young parts covered with white or silvery appressed scale-hairs. Leaves small, simple, exstipulate, with axillary fascicles of smaller leaves. Flowers axillary, solitary or in groups of 2—3. Perianth segments 4—5, almost free. Stamens isomerous, attached to the base of the perianth. Ovary superior, free from the perianth, 2—3 or rarely 4-chambered, each chamber with one ovule; style short or wanting; stigmas 2 or 3.

Fruit loculicidally dehiscent: seeds flattened-reniform.

The type species is *P. cryptocarpus* Fenzl.

Dry regions in South West Africa, the N.W. Cape and the Karoo.

Shoots persistent or commonly the young parts dying back in drought conditions and growth continued by a number of branches arising from the persistent woody basal part. Young parts covered with appressed shining translucent scale-hairs which are acuminate at each end and up to 1·5 mm. long. Leaves opposite or alternate, those on the main shoot falling at or about flowering time, leaving only the axillary fascicles. Plants before and after the fall of the shoot leaves may look rather different. In the descriptions, references to leaves are to those on the main shoots unless otherwise specified. Flowers shorter than the subtending leaves and almost hidden except for the stamens which are shortly exserted when shedding pollen.

Allied to *Galenia* but distinguished by the subsolitary sessile flowers, isomerous stamens, and the ovary quite free from the perianth.

KEY TO THE SPECIES.

1. Leaves opposite.
  2. Leaves flat, broad-based, overlapping: flowers 5-merous . . *cryptocarpus*
  2. Leaves rolled, ericoid: flowers 4-merous . . . . . . *karooicus*
1. Leaves alternate.
  3. Leaves flat or folded upwards: flowers 5-merous.
    4. Leaves oblong-lanceolate, narrowed at both ends: flowers mostly solitary . . . . *sericeus*
    4. Leaves widest near the tip, distinctly petiolate: flowers in groups of 2—3 . . . . *Rehmannii*
  3. Leaves ericoid or deeply concave above: flowers 4-merous.
    5. Leaves not longer than the internodes, curved or falcate, widest near the tip . . . . . . *arenarius*
    5. Leaves longer than the internodes, straight, widest at or below the middle . . . . . . *karooicus* var. *alternifolius*

1. **P. cryptocarpus** Fenzl Ann. Wien. Mus. 2: 288. 1839.

A many-stemmed woody shrublet 20—45 cm. high, with a brush-like outline. Basal parts woody, forking, fluted, usually flattened and up to 1·5 cm. across. Upper parts white or silvery, the ultimate branches opposite but often unequal. Leaves rather crowded, opposite, ascending and overlapping on the young parts, sessile, broad-based, slightly connate, triangular-lanceolate, 0·6—1 cm. long, 0·2—0·4 cm. wide, widest at the base, at the tip acute or almost pungent. Leaves slightly concave above, obscurely keeled below, those in the fascicles smaller and more spreading. Flowers mostly solitary, 5-merous, on the young branches, quite hidden by the leaves. Perianth segments 2—2·5 mm. long.

The type is *Drege* 8024 W, (lost) isotype S.

Rather rare. South West Africa and N.W. Karoo.

The leaves on the shoots fall at or about flowering time leaving only the axillary fascicles. Plants in the younger stages have been confused with *Galenia secunda*.

SOUTH WEST AFRICA. Kl. Karas *Dinter* 5046.

CAPE. Kenhardt. Marydale *Acocks* 15552.

2. **P. karooicus** Verdoorn Bothalia 4: 177. 1941.

A small many-stemmed shrublet woody at the base, the young parts gray or silvery, not white. Shoots erect or sprawling, usually much branched, 10—30 cm. long, the younger with internodes 0·3—0·8 cm. long. Leaves small, opposite, slightly connate at the base, 0·3—0·6 cm. long, linear or linear-lanceolate, concave above, most often rolled and ericoid, ascending when young but spreading as the fascicles develop. Flowers 4-merous, in numerous adjacent groups of 2—3, apparent at anthesis. Perianth segments 2—2·5 mm. long, cucullate, rather broad, rather thinly hairy.

The type is *C. A. Smith* 5286 PRE.

NORTHERN AND CENTRAL KAROO.

A distinctive species, gray or silvery but not white, with ericoid and usually distant leaves and massed 4-merous flowers, which are more conspicuous than in other species.

CAPE. Prieska. Prieska *Bryant* 843; *Pole Evans* 2246—7; Kimberley. Kenilworth *Wilman* 6684; Schmidts Drift *Acocks* H1248. Barkly West. Newlands *Esterhuysen* 5097; Middelburg. Grootfontein *Theron* 531; *Verdoorn* 1527.

ORANGE FREE STATE Boshoff. Boshof *Esterhuysen* 818; Fauresmith. Fauresmith *C. A. Smith* 5286.

Var. *alternifolia* Adamson var. nov.

A typo differt foliis alternis patentibus internodiis longioribus. Leaves alternate, rather crowded, spreading and often falcate, 0·5—0·8 cm. long, distinctly longer than the internodes, less rolled than in the typical form.

The type is *Acocks* 5762 K.

CAPE. Barkly West. Pienaarsfontein *Acocks* 5762.

SOUTH WEST AFRICA Sandfontein (border of Bechuanaland Prot.) *Story* 5077.

3. **P. arenarius** Adamson sp. nov.

Suffrutex decumbens argenteus. Caules pallidi ramis distantibus. Folia alterna, patentia falcata oblanceolata vel sub-spatulata, internodiis breviora. Flores 4-meri, bi-vel tri-nati.

A pale silvery sprawling or prostrate shrublet with shoots up to 1 m. long and rather distant branches. Internodes 0·4—0·8 cm. long. Leaves alternate, 0·3—0·8 cm. long, linear-oblanceolate or almost spatulate, spreading, often falcate, widest near the tip, concave above. Flowers 4-merous, in groups of 2—3.

The type is *Leistner* 1147 K.

Sand-dunes in the S.W. Kalahari region.

A distinctive species recognised by the distant almost spatulate falcate leaves widest near the tip. The leaves are more persistent on the main shoots than in other species. Allied to *P. karooicus* but differing in the laxer more prostrate habit, and the longer falcate leaves of different shape. In collections it has been referred to *P. laxifolius* Verdoorn but differs in the leaves and the 4-merous flowers.

CAPE. Gordonia. Gemsbok Nat. Pk. *Leistner* 1147.

SOUTH WEST AFRICA. Aroab *Acocks* 18066; *de Winter* 3447.

4. **P. sericeus** Pax Bot. Jahrb. 48: 499. 1913.

P. laxifolius Verdoorn Bothalia 4: 178. 1941.

An erect or sprawling white or silvery shrublet, 30 cm.—1 m. high with internodes either short or up to 2 cm. long. Leaves alternate, usually longer than the internodes, those on the main shoots flat, elliptical, narrowed at both ends, 0·4—3 cm. long, 0·1—0·4 cm. wide, acute, almost petiolate, those on the fascicles smaller, thicker, folded upwards. Leaves on the main shoots soon deciduous. Flowers solitary, 5-merous. Perianth segments 2—3 mm. long, hairy outside, slightly cucullate, white or yellow inside.

The type is *Marloth* 741 B. isotype PRE.

Mostly on sand, on the borders of the Kalahari.

A variable species in relation to habitat. In more sheltered situations the plants are larger with longer internodes and fewer branches. Plants with and without the leaves on the main shoots often look different. *Koetze* 824, the type of *P. laxifolius* Verdoorn, only differs in having small rolled leaves. It is an extreme form that is connected by intermediates and cannot be separated.

SOUTH WEST AFRICA. Aroab *Acocks* 15587.

CAPE. Mafeking. Molopo Riv. *Leistner* 561; Vryburg. Vryburg *Acocks* 19186; *Rodin* 3557; Reivalo *Story* 4600; Driffield *Brueckner* 1303. Barkly West. Warrenton *Acock* 5740; Herbert. Salt Lake *Acocks* 8765; Kimberley. Macfarlane *Acocks* 1411; Prieska. Doornberge *Burchell* 1612. "Kalahari Sand Dunes" *Koetze* 824.

5. **P. Rehmannii** Schellenb. Bot. Jahrb. 48: 499. 1913.

Decumbent sprawling or less often erect. Shoots 15—60 cm. long, gray or white, usually sparsely branched. Leaves on the main shoots alternate, as long as or longer than the internodes, 0·6—1 cm. long, 0·2—0·4 cm. wide, spreading, obovate or spatulate, widest near the rather abruptly acute tip, narrowed at the base to a petiole about half as long as the blade. Leaves flat or slightly concave above, usually persistent. Fascicular leaves narrower, smaller, deeply concave above.

Flowers 5-merous in groups of 2—3. Perianth segments 2·5—3·5 mm. long, broad, subobtuse, cucullate, densely hairy outside.

The type is *Rehmann* 5090 Z.

Sand-dunes in dry regions.

Allied to *P. sericeus* but with more persistent leaves with more or less spatulate blades and distinct petioles, larger flowers, and broader very hairy perianth segments. Specimens distributed by Dinter under the MS name "*P. psammophilus*" belong here.

SOUTH WEST AFRICA. Auasberg *Dinter* 3481; Gruendoorn *Dinter* 5045.

ORANGE FREE STATE. Fauresmith. Petrusberg *Acocks* 14018.

Additional species. A single collecting, *Codd* 4840, from Dongola, Zoutpansberg, appears to be a new species which differs from all others in the scanty hair covering, the larger thinner leaves, and solitary pentamerous flowers on short branches. Stems up to 50 cm. long. Leaves distant, thin, about 2 cm. long by 0·5—0·8 cm. wide, with a petiole 0·3—0·6 cm. long. The material is insufficient for a full determination.

ECOLOGICAL ACCOUNT OF A REMNANT COASTAL FOREST NEAR STANFORD, CAPE PROVINCE

By

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(With Plates XXII—XXV)

ABSTRACT

The physical and climatic features of the area are described. A short account is given of the successional communities leading to the formation of forest, and then the two forest communities themselves are described in more detail. It appears that the climax community for this local area is a closed type of forest with an average canopy height of about thirty feet and three species occurring as dominants.

Introduction

This remnant forest, roughly 120 acres in extent, is situated about seven miles south of Stanford, a village between Danger Point and Hermanus in the south-western Cape Province. It differs considerably from the small, scattered forest patches found in kloofs and on screes of the southern slopes of mountain ranges in the rest of the south-western Cape, but shows a resemblance to the coastal forests of the Knysna region further east, and is probably developed from the coastal scrub communities dominated by *Calvaria inermis* which Adamson (1938) mentions as occurring west of the main high forest region at Knysna. The occurrence of a coastal forest of such an advanced type so far west of the forest region is unique; this, together with the fact of its impermanence due to the encroachment of man's activities (Plate XXV, Fig. 2.), led the writer to undertake a rough ecological survey of the area during 1950–1953, in order to record the structure and determine the probable affinities of the forest.

The Habitat

Situation, Extent

The forest is situated just north of a line joining the tiny coastal hamlet of Die Kelders and the equally small inland settlement of Strandskloof to the east. The forest consists of two sections found in folds and depressions on either side of the Baviaansfontein range of hills; westward is the

Short Forest (*Calvaria-Euclea*), about 50 acres in extent (Plate XXII, Fig. 1.), while to the east lies the Tall Forest (*Appodytes-Olinia-Celtis*) with an area of roughly 70 acres (Plate XXIV, Fig. 1). It is in this eastern forest, divided by roads and cultivated lands into three distinct portions, that highest development is attained.

Topography, Geology, Soil

The topography is gently undulating and forest occurs in the broad, sheltered valleys and depressions. Northward the Baviaansfontein hills rise to a height of 1,700 feet but the forest itself lies between 300 and 800 feet above sea level (Plate XXIV. Fig. 2). The Tall Forest is in general somewhat less elevated than Short Forest.

Except for part of the Tall Forest which has a substratum of Younger Cape Granites, the underlying rock formation is Table Mountain Sandstone which is overlain in parts of the Short Forest by a recent thin covering of sandy limestone characteristic of the "strandveld" between Gansbaai and Stanford (Taljaard, 1949). The soil as a rule is therefore sandy and deep, though the Short Forest soil contains some lime and is shallower in parts.

Climate

The climate is equable, *temperatures* seldom exceeding 33 degrees Centigrade in summer or falling below 1 degree Centigrade in winter. Temperature data for the nearest recording centre, Danger Point Lighthouse, show a mean annual temperature of 16 degrees Centigrade, ranging from a mean of 18·9 for the month of January, to 13·3 degrees in July—a range of only 6·6 degrees between means of hottest and coldest months. Similarly the diurnal fluctuations are small, varying from 5·7 to 6·5 degrees difference between mean daily maximum and mean daily minimum temperatures. The meteorological station at Danger Point Lighthouse is situated at the tip of a narrow peninsula jutting about five miles into the sea. Hence the climate at this point will doubtless be more equable, and perhaps more humid, than that at the forest which is about five miles inland from the base of the peninsula.

Precipitation is mainly in the form of rain, the bulk of which falls in late autumn, winter and spring (May to October). Rainfall at Danger Point for the period 1901–1950 averaged 543·8 millimetres per annum, 68% of which fell during the months May to October. Further east the rainfall becomes less seasonal, and in the high forest region of George–Knysna (250 miles eastward) the rainfall is fairly evenly distributed throughout the year.

Sea mists and *low cloud* are not uncommon during late summer, lingering especially in the more sheltered Tall Forest (described later). Humidity at this season is high, especially during the early morning.

Winds during summer are the south-east trades characteristic of this part of the Cape Province. These winds sometimes blow for as long as ten days at a time and are strongest in January; but the south-easters in the region have not the high velocity of those near the Cape Peninsula. Moreover, they contain more moisture, collected during their passage over the ocean, giving rise to the low cloud and mist mentioned above.

The rain-bearing north-west winds of winter are often of great force and violence, though generally of shorter duration than the summer winds. They start blowing in about April and increase in velocity until July–August which coincides with the rainiest time of year. The influence of these cold stormwinds is more severe in the Short Forest on the exposed western side of the hills where a definite wind-moulded physiognomy in the forest is evident, as it tapers off to a wedge of low woody shrubs near the highly exposed coast (Plate XXII, Fig. 1). In contrast to this the Tall Forest, in the lee of the hills, exhibits no wind-moulding yet receives the benefit of a somewhat enhanced rainfall (Plate XXIV, Fig. 1).

The Successional Communities

In the development of climax forest from the short shrubby "macchia", "sclerophyll" or "fynbos" (as the vegetation typical of the south-western Cape is variously termed) certain stages may be discerned. Some of these are primary in that they occur on more-or-less undisturbed sites; more often, as in the recolonisation of cleared forest, they are secondary.

As a result of such activities as felling, burning and grazing which have been practised on the area for generations the basic successional trends have become obscured; the relationships between communities are therefore even more kaleidoscopic and blurred than is usual in natural vegetation of this kind.

The Tall Sclerophyll: Protea-Leucadendron-Thamnochortus Associes.

In parts of the Stanford area fairly stable fynbos associations (similar to the short sclerophyll of much of the rest of the south-western Cape) are to be found only on very shallow limestone soils where the hardy shrubs of the families Proteaceae, Restionaceae, Ericaceae, Thymeleaeceae, Polygalaceae and Rutaceae seldom exceed two feet in height (Plates XXII, Fig. 1. and XXIII, Fig. 2). On deep sand in sheltered situations, on the other hand, the sclerophyll is unstable, forming a *Protea-Leucadendron-Thamnochortus* associes about ten feet high (varying from five to fifteen feet).

The composition is diverse, containing elements of both previous and later successional stages which demonstrate its unstable nature. Codominants in the associes are three tall, leathery-leaved Proteaceous shrubs, often having a bushy habit, namely *Protea mellifera*, *Protea obtusifolia* and *Leucadendron sabulosum*, together with clumps of the reed *Thamnochortus erectus* (Plate XXIV, Fig. 1). Associated woody plants, all of bushy habit in this community, include *Euclea racemosa*, *Rhus glauca* and *Rhus lucida*, while smaller shrubs like *Mundia spinosa* and *Salvia aurea*—usually found in coastal fynbos—and *Leonotis leonurus*—a typical forest indicator—are often present in more insolated parts. The scandent *Microloma tenuifolia* occurs scrambling over the larger bushes.

The associated woody plants (*Euclea* and *Rhus*) appear where the succession is more advanced, and later also *Pterocelastrus tricuspidatus* and *Cassine* spp. intrude (in bushy form only, and accompanied by more climbers) ousting the Proteaceous element. If protected from fire, Tall Sclerophyll is thus gradually replaced by the Mixed Scrub (described later) and eventually by forest. If burnt, Tall Sclerophyll is generally followed by the Leucadendron Consocies as an intermediate stage before the Mixed Scrub appears. Repeated burning will tend to arrest development in the Leucadendron stage.

The Thamnochortus Reedveld

Both in physiognomy and composition Reedveld is similar to Tall Sclerophyll, the chief difference being the marked single-species dominance in Reedveld of *Thamnochortus erectus* which occurs in tall clumps 6 or 7 feet high and spreading to four feet in diameter. This species is by far the most prevalent and constant member of the community, but due to its open stocking the following associated small woody shrubs fill the intervening spaces between reed-clumps:— *Mundia spinosa*, *Passerina vulgaris*, *Protea mellifera*, *Salvia aurea*, *Stoebe plumosa* and the climber *Asparagus aethiopicus*.

In its position in the succession Reedveld is more variable than Tall Scleroplyll, occurring not only as an early stage in primary succession but also after the clearing of forest or scrub. An instance of the latter is seen near the eastern margin of the Uilkraal Tall Forest (described later) on soil which appears no different in depth and texture from that on which forest is found and where the prevalence of indicators such as *Leonotis leonurus* suggest conditions favourable to forest growth.

Reedveld adjoining the Leucadendron Consocies may, if burnt, be invaded quite rapidly by *Leucadendron* and develop to a closed community of this species. Where protected from fire, Reedveld is invaded gradually from the margins by Mixed Scrub constituents such as *Rhus mucronata*, *Euclea racemosa* and later *Pterocelastrus tricuspidatus*, *Olea capensis* and *Gymnosporia buxifolia*, which shade out the sclerophyll constituents until Mixed Scrub is formed.

This is an interesting community and on account of its flexible nature more detailed analysis might be rewarding.

The Leucadendron Consocies

In contrast to the two above-mentioned communities, the Leucadendron Consocies is a distinct, well-defined seral stage. It colonises deep, sandy soil. The bush layer consists of a dense growth of the single dominant, *Leucadendron sabulosum*, a virgate shrub generally 4 to 8 feet high but reaching 15 feet in favourable localities.

This community shows an abrupt margin; there is little natural spread outside the margin; and no previous developmental stages are apparent: this leads one to suspect that it is a secondary sere brought into being only when the natural vegetation has been fired. Fire opens the cone-like seed-heads of *Leucadendron*, scattering the seeds which flourish in ash on the burnt ground, and which spread to form a virile closed community. This takes place if either Tall Sclerophyll or Reedveld is burnt, particularly the former which contains *Leucadendron*. If the Leucadendron Consocies itself is burnt, it will regenerate even more strongly.

If not burnt it becomes tall (15 feet) and branches densely along almost the full length of the stem, forming a compact crown which casts heavy shade and causes decay of the Leucadendron community itself. The shade, together with the humus provided by fallen leaves, gradually create the mesophytic conditions favourable to the development of Mixed Scrub.

The following species, characteristic of the development of Mixed Scrub, were found regenerating under tall dense Leucadendron:—

Woody bushes:

Calvaria inermis, *Euclea racemosa*, *Myrsine africana*, *Olea capensis*, *Linociera foveolata*, *Pterocelastrus tricuspidatus*, *Rhus mucronata*, *Rhus mucronata* var. *latifolia*.

Climbers:

Antizoma capensis, *Asparagus aethiopicus*, *Solanum quadrangulare*.

Shrubs (in openings):

Polygala myrtifolia.

The ground layer is also reminiscent of the ground layer found under forest conditions, and contains among others the following:

Australina lanceolata, *Lachenalia pendula*, *Oxalis pes-caprae*, *Senecio pinnulatus* and in moist parts *Zantedeschia aethiopica*.

The Mixed Scrub Associes

This is a dense community of the hardier woody shrubs and small trees, all assuming a bushy habit and about 10 feet in height, or 15 to 20 feet where luxuriant. Besides its bushiness the community is characterised by diversity of woody species, lack of single dominance and layering, and absence of a ground layer.

Mixed Scrub is found in the following situations:

(i) as a precursor to Tall Forest, e.g. on the slope south and west of the main Uilkraal Forest;

(ii) as a stage in the regeneration of over-exploited forest, e.g. to the east of Uilkraal Forest and the greater portion of Stanford forest-remnant; and

(iii) as an edaphic sub-climax on the dry northern slopes of limestone outcrops, where the soil is shallow and well-drained, e.g. at Uilenkraal River Poort (Plate XXIII, Figs. 1 & 2).

Typical components of Mixed Scrub are:—

Woody Plants:

Calvaria inermis[1], *Olea capensis*[1], *Linociera foveolata*[1], *Cassine barbara*[2], *Euclea racemosa*[2], *Gymnosporia buxifolia*[2], *Olea africana*[2], *Pterocelastrus tricuspidatus* (bushy form)[2], *Carissa bispinosa*[3], *Gymnosporia lucida*[3], *Rhus lucida*[3], *Chrysanthemoides monilifera*[4], *Osyris compressa*[4], *Rhus glauca*[5], *Rhus mucronata*[5], *Rhus tomentosa*[5].

Climbers:

Cassine tetragona[6], *Antizoma capensis*, *Dolichos gibbosus*, *Solanum quadrangulare*, *Tetragonia fruticosa*, *Vicia sativa*.

Plants found in openings:

Cineraria geifolia[7], *Leonotis leonurus*[8], *Lycium afrum*[8], *Solanum sodomaeum*[8], *Pelargonium lobatum*[9], *Pelargonium vitifolium*[9], *Mundia spinosa*[10], *Passerina vulgaris*[10].

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1 = tallest plants in highest-develcped areas.
2 = Woody bushes commonly found in scrub.
3 = Found mainly or solely in the limestone sub-climax areas.
4 = Semi-woddy shrubs mainly characteristic of coastal fynbos.
5 = Low woody bushes mainly characteristic of inland fynbos.
6 = Scandent woody shrub in highest developed areas.
7 = Annual.
8 = Shrubs.
9 = Herbs.
10 = Shrubs typical of previous communities.

Under Mixed Scrub, because of the dense shade, a ground layer is absent except in some large openings where a low-growing xerophytic (often succulent) ground flora is found, in contrast to the mesophytic, shade-loving plants found in a corresponding position in forest. In overcut forest regenerating to Mixed Scrub, *Calvaria inermis*, *Gymnosporia buxifolia* and *Euclea racemosa* coppice profusely from stumps, forming a dense thicket which tends to dominate small localised areas.

Of the seventeen woody plants listed above, fourteen are mentioned by Phillips (1931: pp. 139 *et seq.*) as occurring in the scrub communities of the Knysna forest region. The three remaining species (*Cassine barbara*, *Gymnosporia lucida* and *Rhus glauca*) are concentrated in the south-western Cape and rarely, if ever, extend as far east as Knysna.

The Forest Communities

Two forest communities may be recognised: Short Forest and Tall Forest. These differ from the communities previously described in that their upper layer consists of trees with well-marked trunks and distinct crowns. While in intact forest the crowns interlace to form a continuous canopy casting even shade upon the ground, much of the forest here described has a discontinuous canopy caused by excessive exploitation of the tree layer.

Calvaria-Euclea Short Forest

This community, comparable to the "bush" described by Phillips (1931: p. 136) can be transitional between Mixed Scrub and Tall Forest.

In the Stanford area, however, Short Forest is more often found as an edaphic sub-climax of Tall Forest because the substratum of Table Mountain Sandstone is overlain by a thin covering of sandy limestone which makes the soil coarser, shallower and less moist. The Short Forest formed on this soil is of a relatively stable nature and may remain in the sub-climax stage possibly for centuries (Plate XXII, Fig. 1).

Although Short Forest is taller and somewhat more luxuriant than scrub, the form of the trees is more crooked and stunted than in climax forest (Plate XXIII, Fig. 1). General canopy height is about 20 feet though individuals to 30 feet occur, and in the older well-developed parts, especially near streams, characteristic forest conditions have been produced. As a result of this and of leaf litter, soil conditions are somewhat improved, but insufficiently to allow the invasion of climax forest dominants.

This then is the essential difference between Short Forest and Tall Forest: the former contains principally Mixed Scrub species but the population pattern differs from that of Mixed Scrub, and dominance is manifest; whereas Tall Forest is marked by the occurrence of the three mesomorphic forest species *Celtis rhamnifolia, Olinia cymosa* and *Apodytes dimidiata.* Of these, only the first named is found rarely in Short Forest; the other two are entirely absent.

Floristically the dominance of *Calvaria inermis* is characteristic of Short Forest. Closely associated is the co-dominant *Euclea racemosa* occurring principally as densely-coppicing, much-branched trees in large openings or near the margins (Plate XXII, Fig. 2), though tall single-stemmed individuals to 30 feet are found within the forest. Subdominant tree species of the Short Forest are *Linociera foveolata, Olea capensis, O. africana, Cassine barbara* and *Gymnosporia buxifolia.*

Marked layering is not found in Short Forest. *Myrsine africana*, which can stand dense shade, is the only low shrub below the canopy, and the ground layer is represented by the following:

Droguetia ambigua
Droguetia thunbergii } Dominant, very common, forming a carpet.
Stipa dregeana: associated, fairly common.
Knowltonia rigida: in shadiest places.

Openings in Short Forest are frequent due to felling of the trees. Here *Calvaria inermis* is found regenerating by stem coppice (Plate XXV, Fig. 1) and *Euclea racemosa* by root suckers (Plate XXIV, Fig. 2). The following shrubs also occur:

Solanum sodomaeum var. *hermanii:* a stout shrub.
Solanum quadrangulare: a scrambling shrub.
Metalasia muricata: normally characteristic of coastal macchia (Plate XXIII, Fig. 1), while *Droguetia ambigua* and *Nemesia versicolor* form the ground layer. Climbers in Short Forest are represented by:

Antizoma capensis, Asparagus aethiopicus, Asparagus asparagoides, Cynanchum obtusifolium, Kedrostis nana, Melothria punctata, Solanum quadrangulare.

Short Forest is confined to the western side of the Baviaansfontein hills on a gentle slope facing the sea. Its main occurrence is a patch of some 50 acres about two miles from the coastal hamlet of Die Kelders. This lies in a depression of the hills and is quite well developed but a wedge of scrub penetrating nearly to the edge of the coastal dunes within 300 yards of the sea exhibits the wind-moulded physiognomy referred to earlier.

Much of the lower-lying country to the north, for about ten miles along the Kelders—Stanford road, shows signs of previous occupation

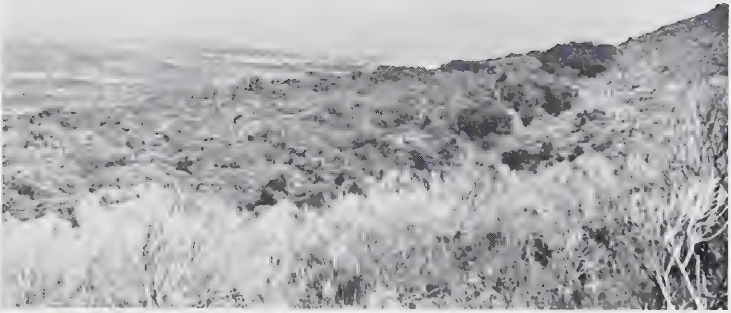

FIG. 1

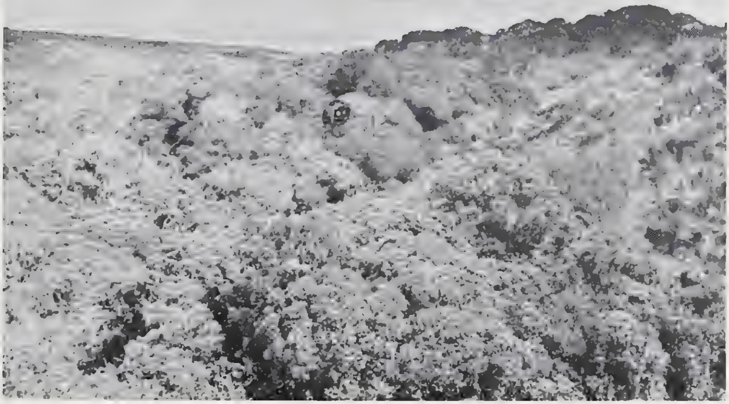

FIG. 2.

PLATE XXII, FIG. 1: A general view of Short Forest, showing its situation at the base of a hill and its proximity to the sea (at Kelders). On the right-hand side, the abrupt transition from forest to short sclerophyll of the limestone ridge is clearly marked. In the foreground is a marginal stand of *Metalasia muricata.*

FIG. 2: Detail of Short Forest. The dark-crowned trees on the right-hand ridge are *Calvaria inermis*, the lighter ones in the foreground mainly *Euclea racemosa*.

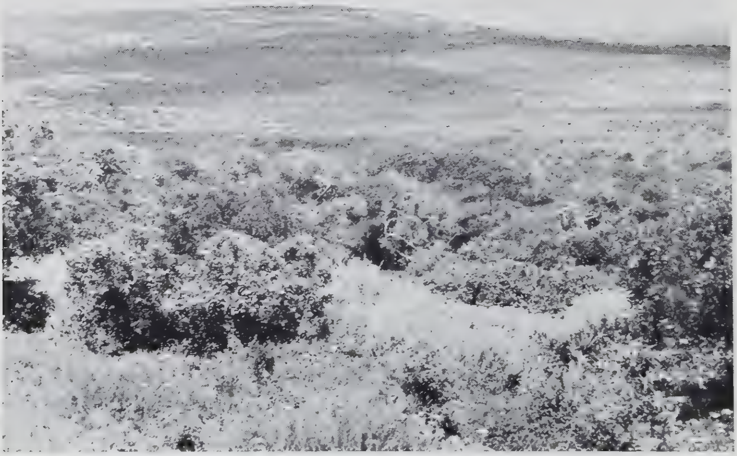

FIG. 1.

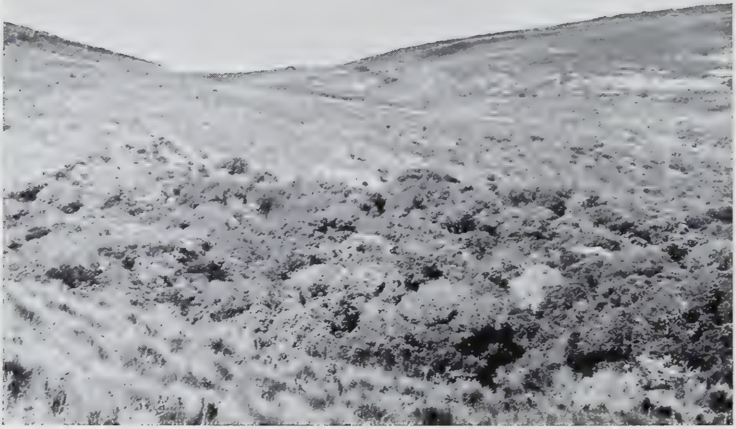

FIG. 2.

PLATE XXIII, FIG. 1: The gnarled and stunted nature of the trees of Short Forest is here clearly visible. Those nearest the camera are poor specimens of *Calvaria inermis*, and in the opening between them is a dense (light grey) stand of *Metalasia muricata*. Mixed Scrub in the background.

FIG. 2: An outlying arm of Short Forest in a sheltered depression. Note the white limestone outcrops beyond, with the Mixed Scrub Associes between them and on the hills beyond. In the foreground is short sclerophyll on a limestone ridge.

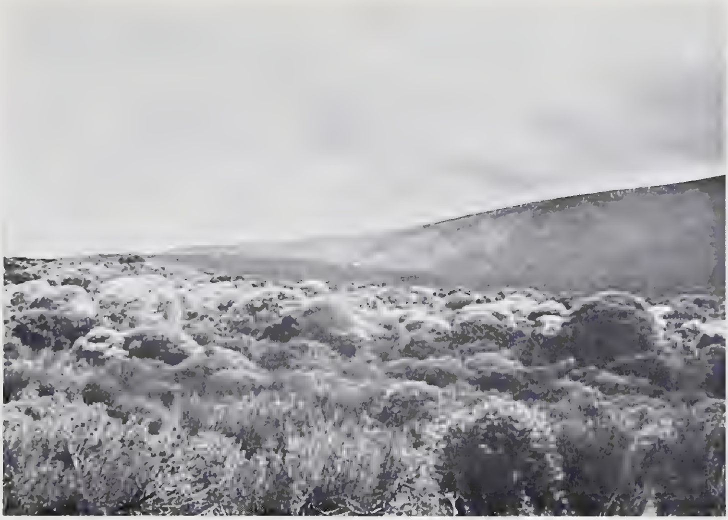

Fig. 1.

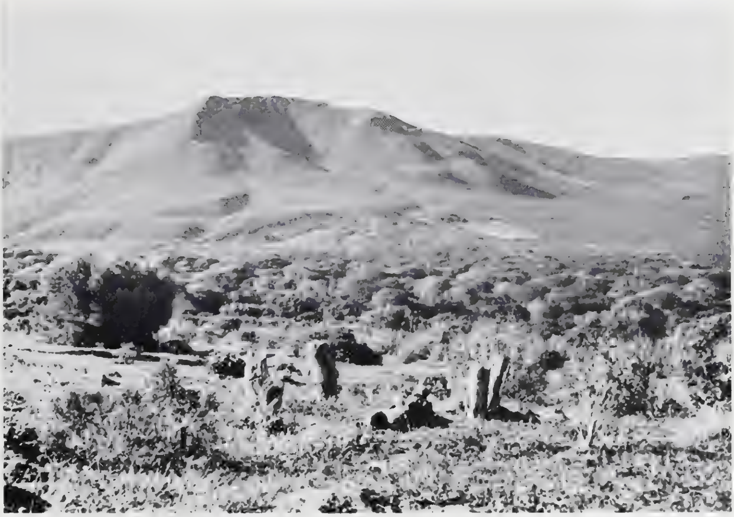

Fig. 2.

Plate XXIV, Fig. 1: A general view of Tall Forest in the lee of the Baviaansfontein hills. Light-coloured trees with rounded crowns are mainly *Celtis rhamnifolia*, about thirty feet high. Note the park-like appearance. In the foreground, *Thamnochortus erectus* and *leucadendron sabulosum* of the Tall Sclerophyll can be seen.

Fig. 2: The situation of Tall Forest in the lee of the Baviaansfontein hills which rise to about 1,700 feet above sea-level at this point. Forest destruction is taking place in the foreground, with coppice regeneration of Calvaria and Euclea. The large bush on left in middle distance is an alien, *Acacia cyclops*, which rapidly invades disturbed land.

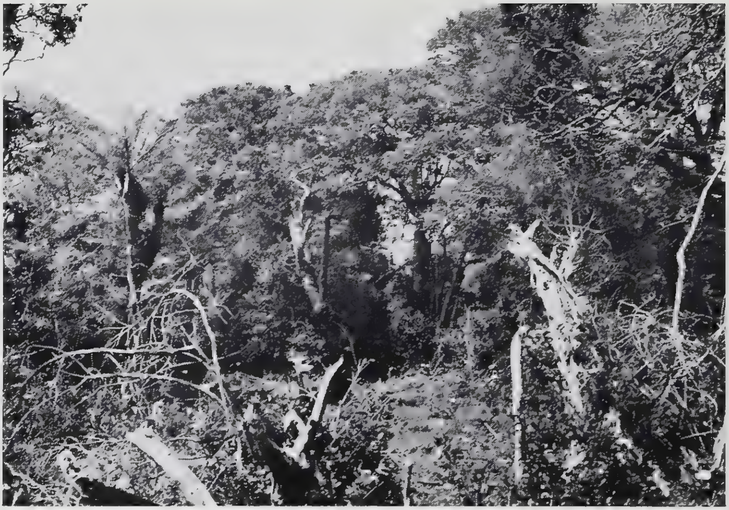

Fig. 1.

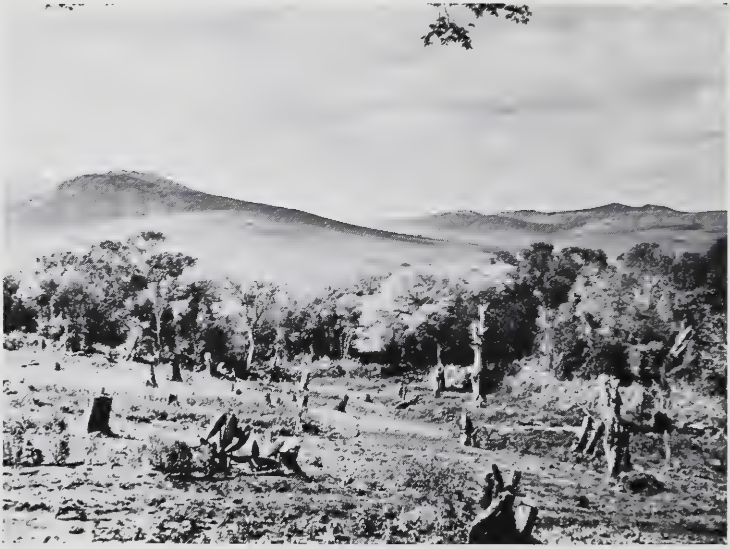

Fig. 2.

Plate XXV, Fig. 1: A near view of the structure of Tall Forest, with shrub layers visible. In the foreground is a clearing where only debris is left after the large trees have been felled; the white flowers are *Zantedeschia aethiopica*, and young coppice shoots of *Calvaria inermis* can be seen.

Fig. 2: This shows where a large area of Tall Forest has been ruthlessly exterminated to make way for cultivation.

by Short Forest but due to the destructive hand of man this has now degenerated to Tall Sclerophyll, Reedveld or Leucadendron, with a few relict patches of Short Forest in favourable areas, particularly near Stanford.

Celtis—Olinia—Apodytes Tall Forest

Climax Association and Dominant Species

The best example of this association is at Uilkraal (*vide* map) where about 70 acres of Tall Forest occur in a well-watered depression to the east of the Baviaansfontein hills. Being east- and south-facing, protected from unfavourable north-westerly winds yet receiving higher summer humidity from the south-easterly mists, and having a deeper, moister soil than Short Forest, this Tall Forest has attained a higher degree of development.

That this is the climax forest vegetation of the region is apparent from its greater canopy height (averaging about 30 feet with individuals to 43 feet) and from its stability of composition in which *Celtis rhamnifolia*, *Olinia cymosa* and *Apodytes dimidiata* occur as dominants. Minor forest species such as *Kiggelaria africana* and *Canthium mundianum* are also more abundant in Tall Forest than in Short Forest. All these species characterise the forest region of Knysna and, beyond, up the coast into Natal.

Layer Communities

The separation of the forest structure into layers is most apparent in the highest developed central part of the forest. In such places four layers can be discerned: the tree layer, tall shrub layer, low shrub layer and a herbaceous ground layer.

Tree Layer

Components of the Tree Layer are as follows:

		Frequency (1—5)
Apodytes dimidiata	Dominant	4
Olinia cymosa		3 +
Celtis rhamnifolia		4 +
Calvaria inermis	Subdominant	4
Canthium mundianum	Associated with dominants	2 +
Canthium mundianum var. pubescens		2 +
Kiggelaria africana		3
Linociera foveolata		4
Olea africana	Mainly associated with subdominant	4 —
Gymnosporia buxifolia		5
Euclea racemosa		5 +

Some parts of the Tall Forest are distinctly park-like in appearance with gracefully spreading *Celtis rhamnifolia* dominants spaced roughly 50 feet apart (Plate XXIV, Fig. 1), the intervening openings being densely grown with lower trees including:

Gymnosporia buxifolia *Euclea racemosa*	more xeromorphic
Canthium mundianum *Linociera foveolata*	more mesomorphic

Even the most highly developed parts of the forest where all three dominants are present, are rather open with a fairly regular spacing of about 25 feet between large trees. Of the three dominants, *Olinia cymosa* appears to be the most constant. The other two show preferences for particular sites, *Celtis rhamnifolia* being found mainly in the north and east, *Apodytes dimidiata* in the west. Of all three dominants the latter species apparently indicates the most mesophytic conditions: the suppression of the xeromorphic *Euclea racemosa* and *Gymnosporia buxifolia* and the appearance of *Canthium mundianum* and *Olea foveolata* (mesophytes) under the shade of *Apodytes*, is a notable feature. The fact that *Royena lucida* in the tall shrub layer is most closely associated with *Apodytes dimidiata* leads one further to conclude that *Apodytes* represents the highest development in Tall Forest.

Past exploitation has caused considerable variation in crown density of this layer, which in turn largely determines the character of the lower layers. As height decreases layering becomes indistinct; if as often happens the tree and tall shrub layers merge, then the remaining two layers are present only sporadically. With heavy over-exploitation this degeneration is carried further to a stage where only a tangled thorny thicket of the most xerophytic species remains, forming a single-layered scrub community with clean floor devoid of ground layer.

Tall Shrub Layer

The presence and composition of this layer depend on the amount of shade cast by the tree layer; direction of sunlight may also be important. In high forest the tall shrub layer, 8 to 10 feet in height, is represented by a single species, *Royena lucida*, occurring singly and thus forming a discontinuous layer. It is found in areas of dense shade, being associated most closely with *Apodytes dimidiata*, the chief dominant.

In less shady areas regeneration of trees—principally *Calvaria inermis*, *Olea foveolata*, *Gymnosporia buxifolia* and *Euclea racemosa*—occur in this layer. The two last-mentioned, which prefer more light, are predominant in openings receiving northerly and easterly sunshine.

Cassine tetragona, a scandent shrub 6 to 10 feet high, is also found in the Tall Shrub Layer.

Low Shrub Layer

Like the previous layer, the Low Shrub Layer typical of high forest is dominated by a single species, *Myrsine africana*. This shrub, 2 to 4 feet high, is abundant and evenly spread under the denser shade of forest trees and of the Tall Shrub Layer.

In more open localities the sclerophyll shrubs *Solanum sodomaeum*, *Podalyria myrtifolia* and *Rhus tomentosa* intrude to form a low shrub layer within the forest, while *Salvia aurea* and *Leonotus leonurus*—often found in Reedveld—occur also in degenerate forest.

Ground Layer

Here again light has an important influence on composition. In addition, because many of its components are annuals, the character and height of this layer vary with the seasons. Most complete ground coverage is found during the winter and spring growing seasons when general height is about 12 inches.

In high-forest shade the nettle *Australina lanceolata* is dominant; *Oxalis pes-caprae* and *Ehrharta erecta* are associated with it, all three covering the ground like a carpet. Scattered among these are the geophytes *Lachenalia pendula*, *Melasphaerula ramosa* and *Zantedeschia aethiopica* (Plate XXV, Fig. 1).

Where growth of the above is excluded by heavy shade, for example under dense scrub, the ground layer is absent except for patches of the geophyte *Chasmanthe aethiopica*. On slightly more open sites the taller herb *Senecio pinnulatus* occurs in pure stands. As openings increase in size, such as towards the margins or where large trees have recently been felled, the number of species in the ground layer also increases. Being mainly annual herbs (the families Umbelliferae, Scrophulariaceae and Compositae predominant) these plants often occur in small pure clans or societies but though the ground coverage is nearly complete during the growing season there is no general dominance. Main components, varying from 6 to 24 inches in height, are:

Caucalis africana, *Cenia sericea*, *Cerastium capense*, *Droguetia ambigua*, *Erodium malachoides*, *Hemimeris sabulosa*, *Nemesia versicolor*, *Senecio burchellii*.

Larger openings contain the following:

Conium maculatum (with succulent stem, to 6 feet)
Adenogramma glomerata (spreading and slender, semi-succulent).

Dorotheanthus muirii (creeping succulent); from which it would seem that xerophytism in the form of succulence is a character of the plants in large openings receiving full sunlight during the middle of the day.

Climbers

The climbers in Tall Forest include most of those named earlier together with one or two not yet mentioned.

Kedrostis nana, *Cynanchum obtusifolium*, *Melothria punctata* and *Phaecocapnos cracca* are found mainly under mesophytic, shady conditions. In situations where some light can penetrate, as on moribund trees with thin crowns or on trees adjoining openings made by felling, a tangle of many species occurs, among which are *Asparagus asparagoides* and *Secamone alpini*. Drier areas within the forest may be colonised by *Antizoma capensis*, *Asparagus aethiopicus* and *Zehneria velutina;* these are also common along the forest margin or in Mixed Scrub. *Cassine tetragona*, a scandent shrub, appears in the Low Shrub Layer of the forest.

ACKNOWLEDGEMENTS

Professor C. L. Wicht (Institute for Forestry, University of Stellenbosch) and Dr. K. H. Schütte (Department of Botany, University of Cape Town) gave useful comment and advice in the field, while Professor A. W. Bayer (Department of Botany, University of Natal) has been most painstaking and constructive in his criticism of the draft. The many plant specimens were named by the herbaria of the South African Museum, and the National Botanic Gardens, Kirstenbosch.

I am sincerely grateful to all these for their aid.

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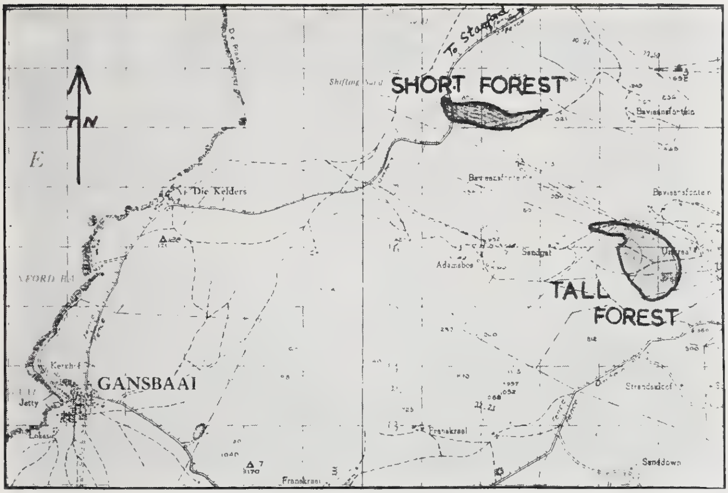

FIGURE 1: Locality map of the area. The positions of Short and Tall Forest have been roughly sketched in.

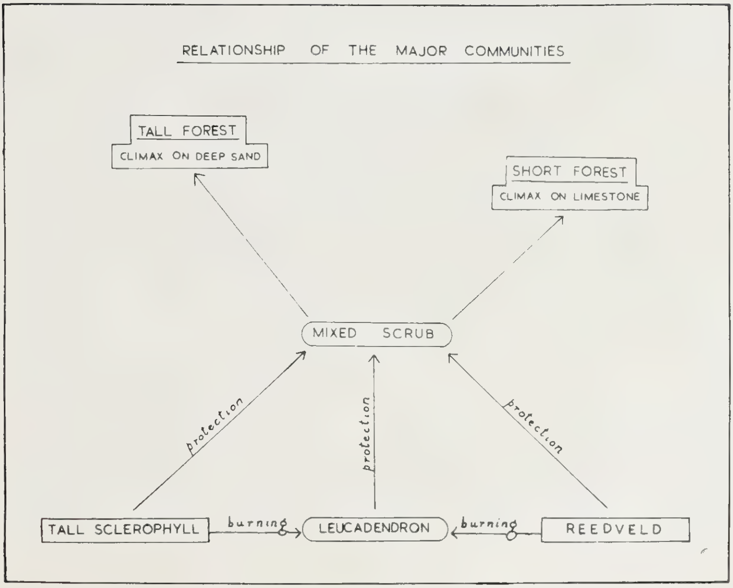

FIGURE 2: Diagrammatic relationship of the major communities.

FRANCIS MASSON, A GARDENER-BOTANIST WHO COLLECTED AT THE CAPE

By Mia C. Karsten

Part V. *Masson as a Draughtsman. Stapeliae Novae.* This Journal, Vol. XXVII, Pt. I, January, 1961.

Addendum

We are indebted to Mr. H. Hall of the National Botanic Gardens of South Africa at Kirstenbosch, Newlands, Cape, for the following interesting information about Masson's "lost plants": three of which have actually turned up during the last few years. Mr. Hall's own words are quoted. We have added, between square brackets, in which part of the Cape the localities mentioned by him are to be found.

14. *Stapelia asterias*, Mass. (see p. 30): "Quite a number of individual plants from the area between Barrydale and the Langeberg [Western Cape] have conformed fairly closely with Masson's *Stapelia asterias*, though I admit that the majority of plants are his *S. asterias* var. *lucida*, N. E. Br."

17. *Stapelia acuminata*, Mass. (see pp. 30–31): "This species is also fairly well localised now, also having myself seen numerous plants at Bowesdorp and Bitterfontein [Little Namaqualand], and around Loeriesfontein [edge of Roggeveld, adjoining Bushmanland]. Plants from the last named place are rather distinct from the others."

35. *Stapelia parviflora*, Mass. (*Caralluma parviflora*, N. E. Br.), see p. 33: "This I have found near the so-called Groenrivier, Western Namaqualand, along a now very unfrequented road which, said Mr. N. S. Pillans, was most likely the road taken by the early travellers, to avoid the more hilly country inland where the modern road goes. Furthermore I once found, under one bush, in the same year (1954) near Nuwerus [Little Namaqualand] one plant of *C. parviflora* and another very rare species, *C. villetii* Lückhoff, both flowering and a great thrill. A portion of the *C. parviflora* I sent to England, shortly afterwards flowered and was photographed in colour."

Apart from the above notes on some of Masson's "lost plants", Mr. Hall gives some additional information about the habitat of Masson's *Stapelia concinna* (No. 18, see p. 31). He writes that Mr. R. C. Littlewood, employed at the Karoo Garden, Worcester, informed him that he has found *S. concinna* in the Robertson veld (Little Karoo), right on his doorstep, as it were. Mr. HALL has a plant of this species, but has not seen the flowers yet. However, Mr. LITTLEWOOD did see the flowers, and since he is known as a very keen and discerning man, there is very little doubt that he has found the true species and not the better known variety.

CORRIGENDUM

P. 20, under GERANIACEAE: the quotation from SOLANDER'S MSS. should read: "*Monsonia* sp. No. 2 in Swartland . . . ", instead of Massonia sp., etc.

NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

By H. M. L. Bolus

Astridia ruschii.—Rami 2 visi, ad 14 cm. longi, ad 1 cm. diam., internodiis 8—25 mm. longis; partes herbaceae velutinae, pallide cinereae, interdum pallide roseo-suffusae, senectae brunneo griseae; folia diu fere erecta, demum patentia, supra visa acuta vel acuminata, lat. visa saepius prope apicem angustata, rarius fere rotundata, ad 6 cm. longa, medio 8—14 mm. lata, 1—2·3 cm. diam.; bracteae lateraliter visae inferne late ovatae, acutae vel acuminatae, marginibus medio subexcavatis, ad 2 cm. longae cum vagina 3 mm. longa, ad 1 cm. diam.; receptaculum fere semiglobosum, ad 5 mm. longum, 1·3 cm. diam.; sepala 6, superne carinata, 1·1—1·3 cm. longa, basi 5—9 mm. lata, exteriora acuta vel subacuta, interiora superne subulata, subula acuminata; petala ca. 5-seriata, nivea, exteriora inferne leviter angustata, obtusa vel acuta, ad 2·6 cm. longa, ad 2·5 mm. lata, interiora pauca, 8—13 mm. longa, 0·25—1 mm. lata; staminodia nulla; filamenta erecta conferta, inferne alba, superne lutea, antheris pollineque luteis; ovarii lobi fere erecti, valde compressi, fere ad 2 mm. elevati; stigmata 6 mm. longa; capsula senectissima tantum visa, expansa 2 cm. diam., tuberculo conspicuo subcucullato.

South-West Africa: "in the southern parts," *E. Rusch* et *F. Erni*. Fl. Government Gardens, Windhoek, Jul.—Aug. 1937. Comm. *H. M. Holloway* 24.

Astridia latisepala.—Planta 25 cm. alta; rami virgati, internodiis ad 4 cm. longis; partes herbaceae minutissime velutinae, sat pallide glauce virides; folia ascendentia, rarius subfalcata, supra visa plana acuta, apiculo subpungente, lat. visa apicem versus angustata, acuta, lateribus leviter convexis, obtuse, vel superne acute, carinata, inter gracillima in genere visa, 4—6·6 cm. longa, medio 5—7 mm. lata, 7—10 mm. diam.; pedunculi 5 mm. longi; bracteae lat. visae obtusae vel acutae, interdum parum supra medium margine leviter excavato, ad 1·7 cm. longae, basi 8—10 mm. diam.; receptaculum late obconicum, 5 mm. longum, 1 cm. diam.; sepala omnia ± marginata carinataque, 1—1·4 cm. longa, basi 5—13 mm. lata, lat. visa superne valde compressa, extima obtusa, ad 3 mm. diam., interiora e medio subulata acutissima; petala exteriora ca. 2-seriata, inferne (in genere) conspicue angustata, apice rotundata vel obtusa, dimidio inferiore albo vel pallido itaque oculum formante, dimidio superiore rubro, ad 2·3 cm. longa, 2—3·5 mm. lata, interiora pauca, diu cum staminodiis ad stamina appressa; staminodia numerosa, prope apicem patentia, alba; filamenta ca. 7-seriata alba, ad 1·1 cm. longa, intima parum supra medium papillata, antheris pollineque aureis; ovarii lobi obtuse compressi, discum non attingentes, ad 1·5 mm. elevati; stigmata 7—8 mm. longa cum cauda 2 mm.; capsula infra obconica, 5 mm. longa, suturis 6 mm. altis, 1·6 cm., expansa 2·7 cm., diam., carinis inferne parallelis distantibusque, superne leviter divergentibus, arista ad 3 mm. longa, fere apicem valvae attingente; semina saturate brunnea, tuberculata, 1·5 mm. longa.

Cape Province: Namaqualand; Richtersveld, Helskloof, *H. Hall.* N.B.G. 120/58. Fl. Apr. 1961.

Astridia rubra (L. Bol.) L. Bol., comb. nov.—*M. rubrum* L. Bol., Mesemb. II : 275 (Jul. 1931). *Ruschia rubra* (L. Bol.) L. Bol., l.c. III:220 (Aug. 1950).

Astridia longifolia (L. Bol.) L. Bol., comb. nov.—*M. longifolium* L. Bol. in Journ. Bot. (1928) 196; *Ruschia longifolium* (L. Bol.) L. Bol., Mesemb. III : 220 (Aug. 1950) non *R. longifolia* L. Bol., l.c. II : 500 Feb. 1935); *R. jacobseniana* L. Bol., l.c. III : 260 (Aug. 1954).

Astridia dinteri L. Bol., nom. nov.—*M. velutinum* Dtr. in Fedde, Repert. 19 : 149 (Aug. 1923) non *M. velutinum* L. Bol. in Ann. Bol. Herb. III : 124 (Sept. 1922); *Astridia velutina* (Dtr.) Dtr. et Schwant in Zeit. fur Sukk. III : 16 (Feb. 1927).

Astridia rubra (L. Bol.) L. Bol. var. **alba.**—A forma typica differt indumento minus velutino; foliis saepius leviter gracilioribus, ad 5 cm. longis, 1·2 cm. latis, 1·3 cm. diam.; floribus majoribus, ad 6 cm. diam.; sepalis angustioribus; petalis laxe patentibus, inferne minus angustatis, cum staminodiis filamentisque albis; staminodiis interdum stamina excedentibus; ovarii lobis discum non attingentibus.

Cape Prov.: Namaqualand; Swartpoort, Richtersveld, "about 3 miles upstream from Sendelings Drift," *H. Hall* 1308a, N.B.G. 107/58.a[1])
Fl. Mart.—Apr. 1961.

Astridia rubra (L. Bol.) L. Bol. var. **citrina.**—A forma typica petalis pallide citrinis; ovarii lobis erectis (non stellate patentibus); stigmatibus stamina excedentibus differt. Folia ad 7 cm. longa, ad 1·9 cm. diam.

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[1] These 2 plants *A. rubra* and *A rubra* var. *alba* were collected at the same place and at the same time and were believed to be the same, whereas when they flowered varietal differences were seen. The number of the species was given with an additional "a" to distinguish it. L.B.

South-West Africa: "in the southern parts," *E. Rusch* et *F. Erni.* Fl. Government Gardens, Windhoek, Jul.—Aug. 1937. Comm. *H. M. Holloway* 58.

Astridia blanda L. Bol.—forma **latipetala.** Petala inferne conspicue angustata, ad 3 mm. lata.

South-West Africa: "in the southern parts," *E. Rusch* et *F. Erni.* Fl. Government Gardens, Windhoek, Jun. 1937. Comm. *H. Holloway* 17.

Astridia blanda L. Bol.—forma **angustata.** Petala apicem versus angustata.

South-West Africa: "in the southern parts," *E. Rusch* et *F. Erni.* Fl. Government Gardens, Windhoek, Jun. 1937. Comm. *H. M. Holloway* 33.

ASTRIDIA Dinter et Schwantes

The genus **Astridia** was based upon *Mesembrianthemum velutinum* Dtr. in Fedde, Repert, 19 : 149 (Aug. 1923, 149) and the new combination *Astridia velutina* (Dtr.) Dtr. et Schwant. was published in Feb. 1927 (Zeit. fur Sukk., III : 16). In the account of his trip to the region of the Klinghardt Mts. in the Namib, which appeared in Nov. 1927 (Gard. Chron. 80 : 430), Professor Dinter writes: "The most extravagant of my discoveries is *M. velutinum* (or, as about the time of publication Mrs. L. Bolus had published a species under that name a short time earlier, I call it now—as every species of *Mesembrianthemum* published under this good old generic name is exposed to danger—*Astridia velutina* Dtr. nom. nov.). Although not deviating by any easily seen attribute from the general habit of *Mesembrianthemum,* it is, out of six hundred species, the only one hitherto known which has not smooth or tubercled seeds, but they are covered thickly with hollow hairs or tubules which give them the appearance of little sponges. It is a fine, stately species occurring together with *M. gigas, M. quartziticum* and *M. psammophilum,* in sand-filled cracks of the dark phonolite and varies in the colour of its showy flowers from purple to white." In 1928 Dr. N. E. Brown (Journ. Bot., 66 : 266) expressed his views on **Astridia:** "This genus may be a good one as the plant has a distinct appearance, but the only characters mentioned whereby it can be distinguished from *Mesembryanthemum*[2]) are that it has hollow hairs upon its seeds and filiform stigmas which taken alone appear to me insufficient for its separation. . . . At present the genus **Astridia** is insufficiently described, but possibly its fruit, when known, will add further characters."

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[2] The "i" in Mesembrianthemum was used by German writers at that time: "y" is older and is now universally adopted. L.B.

Meanwhile, in Oct. 1926, three collections of the genus were made south of the Orange River, their contemporaneous names being *M. longifolium*, between Sendeling's Drift and Doornpoort (*Pillans* 5830), *Astridia velutina* Dtr. var. *lutata* (having the seeds as described in the type of the genus, but not in agreement regarding the sepals and stigmas), between Arris and Sendeling's Drifts (*Pillans* 5725), together with an unidentified species (*Pillans* 5232). These were followed by Herre's collections made in Oct. 1930—*M. rubrum*, Swartwater, Richtersveld (S.U.G. 9202), *M. longifolium*, Helskloof (S.U.G. 9270), and an unidentified one at Grootderm. Two more collections were made in Dec. 1946—*M. longifolium*, Cornell's Kop (*Leighton* 2352) and, notably, an unidentified one at Grootderm (*Leighton* 2373), having the short internodes of *A. velutina*, but not the long papillae on the seeds as in that species. We have also had the privilege of seeing living specimens of plants collected "in the southern portion of South-West Africa", very probably by E. Rusch and F. Erni, which flowered in the Government Gardens, Windhoek, Jan.—Aug. 1937, and were sent by H. M. Holloway to the Bolus Herbarium for identification. Among these are **A. blanda** L. Bol. and **A. ruschii** L. Bol.

Lastly, there are Hall's fine collections made between 1953 and 1960, comprising 5 species, as well as varieties or forms—**A. hallii** and **A. speciosa,** 5—8 miles north of the Orange River, and **A. longifolia, A. rubra** and **A. latisepala** in much the same area covered by the collectors of the southern species mentioned above, with Kuboos (N.B.G. 158/58 and Swartpoort (107/58) as additional stations. The ones still undetermined are the collection from Grootderm (N.B.G. 86/53) and the seedlings raised at Kirstenbosch. All these collections have flowered at Kirstenbosch within the year beginning June 1960, and some of those flowering now in April—May give promise of lasting into June, thus completing the full cycle. This grand opportunity of having all the known species together (except the type) for observation has enabled us to decide in favour of retaining **Astridia** as a sound genus, easily recognized by the general similarity of form of its closely allied species, and confined to a comparatively small area north and south of the Orange River. It is most nearly allied to **Ruschia,** having the same fruit-structure; but, apart from its seed-character, which is varied, and the large showy flowers, which are almost unknown in that extensive genus, it *may* also be distinguished by—(1) the close attachment of the leaves and bracts to the branches and peduncle, so that they are removed, entire, with some difficulty, leaving, as it seems, a portion of their base when they eventually fall; (2) the large, deeply concave bracts differing remarkably in form from the foliage-leaves; (3) the inner stamens usually ciliately papillate in the lower part up to the point where they are densely papillate near the middle. But it is impossible, without making an intensive examination of the numerous species duplicated in the genera, **Ruschia** Schwant. and **Mesembryanthemum** L. (emended by N. E. Br.), to assert without reservation that all these characters are not also to be found, either combined in a solitary species or distributed partly in several species of these genera. They are certainly not mentioned in their original generic descriptions, nor have they been recorded in subsequent emendations.

DESCRIPTION: Erect robust shrublets, 25—30 cm. high, sometimes compact, with the internodes 2—5 mm. long in wild plants, or more loosely and virgately branched, with internodes up to 4 cm. long in wild plants; primary branches 5—13 mm. in diameter; herbaceous parts ± velvety-pubescent or glabrous, or very rarely very minutely pubescent and glabrous in the same collection; leaves nearly erect, ascending, or widely spreading, closely attached to the branch and long-persistent, and what appears to be the extreme base still persisting after the rest of the leaf has eventually fallen, usually decurrent, sometimes subfalcate, upper surface acute, obtuse, or rounded at the apex, in side view usually either ± narrowed towards the apex, which is sometimes recurved, the length being 3—5 times that of the breadth in the middle of the leaf, or ± rounded at the apex, the length being less than 3 times the breadth, obscurely, obtusely, or rarely rather acutely, keeled, the sides slightly convex or rarely strongly compressed, usually about 3—6 cm. long, or rarely, in cultivation, up to 11·7 cm. long and 1—3 cm. in diameter (and thus among the largest in the perennial *Mesembrieae*), the sheath 2—6 mm. long; flowering-branchlets usually 2—4-leaved, the flowers solitary or, terminating a branch, 3-nate, the lateral ones developing much later than the primary one, diurnal, 4—7·5 cm. in diameter; peduncle very short with the bracts near the apex and constricted there by their close attachment; bracts usually differing conspicuously in form from the leaves, broad and deeply concave below and embracing the receptacle, in side view obtuse, acute or acuminate and often ± excavate near the middle of the margins, up to 2 cm. long; receptacle shortly obconic or almost semiglobose; sepals 6, the inner slightly shorter, or rarely one of the inner slightly longer than the outer, which are laterally compressed and obtuse or truncate in side view, the inner subulate in the upper half margined; petals white, pink, "violet-rose," red, or rarely lemon-yellow, the outer longer ones in 1—2 series, the inner much narrower ones in 2—3 series; staminodes usually present, ciliately papillate in the lower part, closely appressed to the conically collected stamens, equalling or slightly exceeding them; filaments about 6—8-seriate, white, red, or orange, the outer ciliately papillate in the lower part, the inner usually ciliately papillate in the lower part as well as densely papillate near the middle, anthers and pollen golden; nectary inconspicuous, anular crenulate 6-angled, the angles rounded; ovary-lobes distant, acutely or obtusely compressed, rarely reaching the nectary; stigmas 6, very narrowly subulate and caudate, very rarely exceeding the height of the stamens; capsule shortly obconic below, the sutures strongly compressed, expanded valves widely spreading, wingless, keels parallel below, diverging upwards, aristate, placental tubercle and roofing membranes well developed, the 2 processes on the under side of the membrane near the mouth obconical; seeds extending to the base of the loculus, covered "with long brown papillate hairs" (Dinter), shortly echinate, tuberculate, or muricate.

I have not been able to see a specimen of Dinter's type of the genus and have had to rely entirely upon the description, which, as far as the sepals are concerned, is possibly erroneous. For this and other reasons (especially the lack of good seed-bearing capsules) the following key is quite inadequate. It is hoped, however, that it may serve to indicate some of the chief distinctions between the species:

1. Herbaceous parts glabrous .. .. *longifolia.*
1. Herbaceous parts velvety-pubescent or very minutely pubescent.
  2. Plants compact (at least in the wild state); leaves usually rounded at the apex and the length less than 3 times the breadth taken in the middle; petals white, pink or "violet-purple", usually up to 2 cm. long.
    3. "Sepals 4, conspicuously unequal in length" .. .. *dinteri.*
    3. Sepals 6, nearly equal in length.
      4. Sepals abruptly acute .. .. *dinteri var. lutata.*
      4. Sepals obtuse or rounded at the apex.
        5. Petals not narrowed towards the apex.
          6. Petals scarcely narrowed downwards, up to 1·5 mm. broad .. .. *blanda.*
          6. Petals conspicuously narrowed downwards, up to 3 mm. broad .. .. *blanda* forma *latipetala.*
        5. Petals narrowed towards the apex .. .. forma *angustata.*
  2. Plants rather laxly branched, branches often virgate; leaves usually narrowed towards the apex which is often recurved in the juvenile state, the length usually more than 3 times the breadth; petals white, pale lemon-yellow, or scarlet or orange-red with a contrasting lower portion, usually more than 3 cm. long.
    7. Diameter of leaves usually up to 1 cm.
      8. Sepals up to 12 mm. broad at the base; petals paler to white in lower half, making a conspicuous eye .. *latisepala.*
      8. Sepals up to 8 mm. broad; petals paler or golden near the base, not making a conspicuous eye .. .. *longifolia.*
    7. Diameter of leaves usually 1·5—2 cm.
      9. Staminodes present.
        10. Petals white or with red predominating; stigmas not exceeding the stamens.

11. Petals white, laxly spreading, 3-seriate .. *rubra* var. *alba.*
11. Petals scarlet or red-orange, 3—7-seriate.
12. Outer sepals obtuse; petals 3-seriate; ovary-lobes stellately spreading; stigmas 7 mm. long *rubra.*
12. Outer sepals acute; petals 6-seriate; ovary-lobes erect; stigmas 12 mm. long .. .. *speciosa.*
10. Petals pale lemon-yellow; stigmas exceeding the stamens .. .. *rubra* var. *citrina.*
9. Staminodes absent.
13. Leaves strongly compressed laterally, sometimes recurved at the apex, acutely keeled, 5—8 cm., or in cultivation up to nearly 12 cm. long; sepals up to 1·2 mm. broad at the base .. *hallii.*
13. Leaves not compressed laterally, obtusely keeled, not recurved at the apex, up to 6 cm. long; sepals up to 9 mm. broad at the base .. *ruschii.*

Mr. Hall, who has seen nearly all the Astridias in their native haunts, has kindly contributed some interesting notes, giving those of us not able to see for ourselves a vivid idea of that "strange land", as he calls it, "its vastness, the stark beauty of the lunar-like landscape, the extraordinary silence and the sense of extreme loneliness when one has climbed for hours on one's own. Time seems to stand still". He notes that: "All the Astridias collected south of the Orange R. are confined to a narrow strip of territory along the lower reaches of the river, a sun-baked, extremely arid region with high summer temperatures. The scanty rainfall is almost entirely during the winter months. The lowest station recorded is Grootderm, some ten miles upstream in a rocky barren-looking, wind-swept area with much loose sand. There they frequent the rock-crevices and firm ground, forming stocky, fleshy-leaved shrubs, rarely more than a foot high. The predominantly succulent vegetation with which they are associated includes *Aloe gariepensis, Pelargonium paradoxum, P. mirabile, Othonna clavifolia, Monsonia multifida, Dracophilus dealbatus* and *Conophytum saxetanum.* From Grootderm the genus extends upstream for about 60 miles (as the crow flies) to the Pokkiespram Hills, a few miles above Sendeling's Drift. This whole area, being beyond the influence of coastal fogs, is even more rugged and barren than Grootderm. Yet the Astridias occurring here have larger and more colourful flowers than those of Grootderm. Further upstream is virtually unknown owing to absence of negotiable tracks—Swartpoort (with *A. rubra*) being the most easterly station recorded S. of the river and Lorelei (with the large white *A. hallii*) N. of the river. Only 2 species venture any distance from the river—*A. latisepala* to Helskloof and *A. longifolia* extending from near the river to as far as Cornell's Kop and Kuboos, the latter being the most southerly station recorded for the genus. Most of the territory on the north bank corresponding to the area mentioned above is wholly 'Sperrgebiet', enclosed in what is termed Diamond Area No. 1. Visitors are firmly discouraged and permits to enter are very limited indeed. What little is known of the vegetation corresponds very closely to that of the south bank. In the Sendelings Drift area, and extending to about 12 miles northward from the river, Astridias are frequently seen growing in patches, again with various flower-colours, suggesting a number of forms or species involved. The most northerly and most interesting station is that of the type-species *A. dinteri*—'between Luderitz Bay and Bogenfels, and the southern end of the Klinghardt Mts.' These areas are at least 100 miles N. of the Orange River. Well within 'Diamond Area No. 1', the Klinghardt Mts. are little known botanically and are likely to remain thus indefinitely, for apart from the permit difficulties they are extremely difficult of access, being wholly within the desolate and forbidding Namib Desert."

Cephalophyllum breviflorum.—Compactum. 5—6 cm. altum; rami 3—6 cm. longi, internodiis 4—6 mm. longis, ad 5 mm. diam.; partes, herbaceae leves, sordide virides; folia diu fere erecta vel alterum erectum, alterum ascendens, demum ambo patentia, supra plana, prope apicem vix angustata, obtusa vel subacuta, lat. visa superne non, vel leviter, angustata, obtusa vel apice fere rotundata, lateribus leviter convexis, prope apicem obscure carinata, vel carina ad lineam reducta, 2·5—4 cms longa, medio 6—8 mm. lata diametroque, vagina 3—4 mm. longa; flore. solitarii; pedunculi teretes politique, 5—15 mm. longi, ad 3 mm. diam., prope basim bracteati, bracteis in feris pedunculum fere includentibus, interdum apicem receptaculi attingentibus, lat. visis altera subacuta, altera apice oblique rotundata, 1—1·3 cm. longis, vagina ad 5 mm,

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longa, medio 5—7 mm. diam.; receptaculum late et breviter obconicum, 4 mm. longum, ad 1 cm. diam.; sepala 5, exteriora obtusa carinata, interiora subacuta, anguste marginata, 7—8 mm., vel 6—8 mm., longa, basi 4—8 mm., vel 4—7 mm., lata; petala 3-seriata, inferne leviter angustata, apice saepissime obtusa vel rotundata, lutea vel aurea, inferne pallida vel alba, 8—11 mm., vel 8—13 mm., longa, 0·75—1·5 mm. lata; filamenta conferta erecta, ca. 4-seriata, dimidio inferiore albo, superiore luteo, ad 4 mm. longa, antheris primo saturate sordideque purpureis, demum cum polline albidis; discus crenulatus inconspicuus; ovarii lobi leves politique, superne obtuse leviterque compressi, ad 2 mm. elevati; stigmata 8—10, anguste subulata, conspicue papillata.

Cape Prov.: in dit. Vanrhynsdorp, Koekenaap, *H. Hall* (N.B.G. 359/54). Fl. parce Mart. ad Maium, 1961.

Cephalophyllum purpureo-album (Haw.) Schwant. Exact locality unknown.—*J. Thudichum.* Karoo Garden 452/60. Fl. Jul. 1960.—This collection is noted here because it more closely resembles the type than any other collection hitherto examined. The species is based upon plants sent to Haworth by Bowie. It was published in 1826 (Phil. Mag., p. 329). and in the Kew Herbarium there is a drawing of the type, of which there is a tracing in the Bolus Herbarium. The collections hitherto recorded are all from the Riversdale and Albertinia Divisions, and they differ from the type in having shorter and broader leaves and smaller flowers, even after being in cultivation for some time. It is quite possible Thudichum's collection is from the same area.

Nycteranthus tenuifolius (L. Bol.) Schwant. var. **speciosa.** A typo (ex exemplis feris descripto) foliis crassioribus; corolla demum (post vesperes plures) fere ad 5 cm. diam., segmentis exterioribus saepe truncatis, ad 2 mm. latis, differt. Flores inodorati.

Cape Prov.: Namaqualand; prope Garies, Sept. 1959, *R. C. Littlewood.* Karoo Garden 355/59. Fl. Aug.—Sept. 1960.

Conophytum stenandrum (*Euconophytum—Picta*).—Reliquiae vaginantes subpergamentaceae, inferne pallide brunneae, superne saturatiores vel griseae; corpuscula glabra, breviter lateque obconica, basi late rotundata, 8 mm. longa, 9 mm. lata diametroque, vel obovata ad 1·1 cm. longa, 7—8 mm. lata, 1·1 cm. diam., supra subconvexa, circularia vel late elliptica, glauce viridia, punctis sparsis vel 2—6 approximatis vel rarius coalescentibus, saturate brunneo rubris, os 2—3 mm. longum distanter circumdantibus, finientibus aggregatis vel coalescentibus; flores nocturni; pedunculus 3—6 mm. longus, basi bracteatus, bracteis ad 2 mm, longis, membranaceis, acute carinatis, carina viridi, inconspicue papillosa, lobis acutis vel altero subobtuso, vaginam leviter excedentibus; receptaculum 1·5—2·5 mm. longum diametroque; calyx 5—7 mm. longus, tubo membranaceo, 3—4 mm. longo, segmentis 4, obtusis vel subacutis, subcarnosis; corolla pallide straminea, 6—9 mm. longa, tubo cylindrico, 3—5 mm. longo, segmentis 2—3-seriatis, obtusis vel emarginatis, intimis subacutis, ad 0·5 mm. latis; stamina ca. 3-seriata, infima prope medium tubi posita, omnia exserta, filamentis pallide stramineis, antheris pallide luteis, gracilibus, ante dehiscentibus ad 1·5 mm. longis; discus breviter divisus, segmentis ca. 12, subtruncatis; ovarium medio conice elevatum, altitudinem disci non attingens; stylus ad 0·75 mm. longus, stigmatibus 1·5—2 mm. longis.

Cape Prov.: in dit. Vanrhynsdorp; "18 miles N. of Bitterfontein," Oct. 1959, *R. C. Littlewood.* Karoo Garden 804/59. Fl. Mart. 1960.

The name is derived from *stenos* = slender and *andrum* = anther.

Conophytum ampliatum (*Derenbergia* § *Cordiformia*).—Reliquiae vaginantes pergamentaceae, pallide, vel demum saturate, brunneae; corpuscula lat. visa late obovata vel fere circularia, vel reniformia, basi rotundata, lateribus valde convexis, glabra levia, saturate viride punctata (in siccis punctis elevatis), 1·8—3 cm. longa, prope medium vaginae ampliatissima, 1—1·3 cm. lata, prope apicem vaginae 1·7—3 cm. diam., lobis supra visis acutis, lat. visis apice rotundatis, marginibus carinaque sordide purpureo-lineatis, apice per 3—6 mm. divergentibus, 3—5 mm. longis, pustula subnulla, parte pellucida subquadrata; pedunculus 1—1·2 cm. longus, basi bracteatus, bracteis acutis, 4 mm. longis; receptaculum ad 2 mm. longum, ad 3 mm. diam.; calyx 7—8 mm. longus, tubo membranaceo, 3—4 mm. longo, segmentis 5, subaequilongis obtusis subcarnosis; corolla aureolutea 2 cm. longa (vel in planta altera ad 2·4 cm. longa), tubo superne leviter ampliato, 9 mm. longo, segmentis 4-seriatis obtusis, interiora perpauca, 0·25—1·5 mm. latis; filamenta ca. 8-seriata, inferiora pallida, superiora bene exserta, cum antheris pollineque luteis; ovarium medio ad 0·75 mm. conice elevatum; stylus 5—6 mm. longus, stigmatibus 5, stylo aequilongis.

Cape Prov.: Namaqualand; "4 miles S. of Nababeep, in rock-crevices on top of a koppie," Oct. 1959, *R. C. Littlewood.* Karoo Garden 715/59. Fl. Mart.—Apr. 1960.

The plant described as **C. andausanum** N. E. Br. var. *immaculatum* ("Mesemb." III, 87) and figured (l.c. Plate 38E) may be a close ally or variety of this species, and future collections may reveal more closely connecting forms. It was erroneously associated with **C. andausanum** being quite distinct from that species, as was stated later—"where the

bodies are narrowed into a stipe-like base and look very different from the oval or rounded oval ones of this variety" (l.c. 198).

Conophytum turrigerum N. E. Br. [Cape Prov.: in dit Malmesbury; Kalabas Kraal, "on granite rock," Apr. 1960, *D. Wood* (N. B. G. 314/60). Fl. Apr. 1960, 1961.]

This species is specially interesting as being the one found nearest to Cape Town, and Mr. Wood's collection is noted here as representing an additional station for it. Kalabas Kraal is 40 miles from Cape Town (by rail) and 10 miles N. of Klipheuvel, the type-locality, the northern limi, of its distribution being "near Malmesbury" and the southern Paarlberg. The habitat in each case is "granite rocks among moss and lichens". The tissue-paper-like resting-sheaths are well seen in this collection.

Delosperma appressum.—Compactum glabrum, ferum ad 6 cm., cultum 8—9 cm., altum, caule basi ad 1·3 cm. diam.; partes herbaceae luteo virides vel subglaucae; folia diu fere erecta, imbricata appressaque, demum ascendentia, in ramo omnino uniformia vel rarius basi rami pauca ovata, multo breviora, addita, supra visa linearia vel lineare lanceolata, acuta vel acuminata, acute carinata, lateribus planis, lat. visa prope apicem angustata, acuta vel subobtusa, levia, 2·5—3 cm., vel rarius ad 5·2 cm., longa, vagina 2 mm. longa, prope medium ad 8 mm. lata, ad 7 mm. diam., folia breviora supra visa late ovata, ad 9 mm. longa, 7 mm. lata diametroque; pedunculi lateraliter compressi, ad 1—2 cm. longi, prope apicem bracteati, bracteis foliis simillimis, 1—2 cm., vel rarius ad 2·5 cm., longis; receptaculum late obconicum vel fere semiglobosum, leviter compressum, ad 6 mm. longum, 1 cm. et 1·2 cm. diam.; sepala 6, acuta, exteriora carinata, interiora superne cornute subulata, extima ad 1·4 cm., intima ad 1·1 cm. longa, basi 4—9 mm. lata, vel in floribus ceteris multo minoribus ad 7—9 mm. longa; petala dense 5-seriata, exteriora inferne angustata, acuta vel obtusa, ad 1·7 cm. longa, 2 mm. lata, intima filiformia, acuta vel acuminata, eburnea, straminea, vel primulina; staminodia stamina conice conferta aequantia vel bene excedentia; filamenta ca. 6-seriata, cum antheris pollineque lutea, vel intima alba, exteriora glabra, intima parum supra medium dense papillata; glandulae crenulatae; ovarii lobi obtuse compressi, per 1·5—2 mm. elevati; stigmata 6, anguste subulata, 3—4 mm. longa cum cauda ad 1 mm. longa.

Cape Prov.: in dit. Albany; "3 miles from Grahamstown along the Cradock Rd., on stony outcrop," Apr. 1952, *G. V. Britten* (Albany Museum Herbarium 40). Fl. hort. L. Bolus Dec. 1952, Mart. 1955, Nov. 1958.

Delosperma lehmannii proxime accedit.

Delosperma gracile.—Plantae 2 visae, cultissimae, ut videtur, in affinitatibus **D. lehmannii** gracillimae visae, glabrae, ad 10 cm. altae, basi caespitosae, ramos floriferos elongatos emittentes; folia uniformia supra e prope medium superne angustata, acuta vel acuminata, lat. visa apice tantum leviter angustata, altero paris acuto, altero oblique rotundato, acute carinata, 3—6 cm. longa cum vagina 1 mm. longa; pedunculi 5—15 mm., fructiferi ad 3 cm., longi, prope apicem bracteati, bracteis 1·5—2 cm. longis; receptaculum subglobose obconicum, 2-carinatum, 4—5 mm. longum, 6—8 mm. diam.; sepala 6—8, acute carinata, acuminata, 4—7 mm. longa, basi 1·5—5 mm. lata, interiora late marginata; petala ca. 5-seriata, nivea, inferne non, vel leviter, angustata, obtusa vel acuta, 6—15 mm. longa, 0·5—1·5 mm., vel rarius ad 2 mm., lata; staminodia sat pauca, gracillima, stamina conice collecta aequantia vel excedentia; filamenta 3—5-seriata, alba, ad 6 mm. longa, exteriora epapillata, intima supra medium papillata, antheris pollineque aureis; glandulae 6—8, sat distantes; ovarium ca. marginem planum, lobis 6—8, approximatis, obtuse compressis, fere ad 1 mm. sat abrupte elevatis; capsulae solitariae vel 2—3-natae, pedunculo intermedio ebracteato, in 4 visis valvis 6, in 2 valvis 7, infra obconicae, 5—6 mm. longa, 8—11 mm. diam., suturis valde compressis, mox apice ringentibus, 2—3 mm. elevatis.

Cape Prov.: in dit Albany; Seven Fountains, prope Grahamstown, *H. Hall* (N.B.G. 102/59). Fl. Mart.—Apr. 1961.

The normal number of sepals and stigmas in this group of **Delosperma** is 6, and the variation of 6—8 in this species may not be due to cultivation. For the same variation has been observed in wild plants of **D. algoense** collected in Nov. 1960, near Port Elizabeth, by *F. J. Stayner* (Karoo Garden 882/60).

THE ECOLOGY OF *SALVINIA AURICULATA* AND ASSOCIATED VEGETATION ON KARIBA LAKE

By E. A. C. L. E. Schelpe

(*Bolus Herbarium, University of Cape Town*)

(With Plate XXVI)

ABSTRACT

The populations of *Salvinia auriculata* on Kariba Lake are thought to have originated from plants carried down the Zambesi River from older populations occurring upstream from the Victoria Falls. The phenomenal spread of Salvinia in the Lake was favoured by the sheltered habitats provided by the large areas of partly submerged trees. Compacted Salvinia mats have been invaded and bound chiefly by *Scirpus cubensis.*

INTRODUCTION

Salvinia auriculata Aubl. is a floating aquatic fern often grown as an ornamental plant in tropical fish tanks and ponds. It is indigenous to South and Central America and the larger Caribbean islands. Within recent years, this species of Salvinia has become notorious for its extremely rapid vegetative reproduction over areas of still fresh water in tropical and subtropical regions to which it has been introduced. In Ceylon, it is estimated to have spread over 22,000 acres of rice fields and over 2,000 acres of waterways in twelve years. (Williams, 1956.)

In contrast, *S. hastata* Desv., which is endemic to Madagascar and East Africa from Mozambique northwards to Kenya, is a much less rampant grower. It is readily distinguished from *S. auriculata* by the absence of the four-celled, basket-like structures surmounting the leaf papillae, a feature characteristic of *S. auriculata.* (Herzog, 1935.)

The plant body consists of a fragile horizontal stem with an apical growing point and with a pair of floating leaves and a finely dissected submerged leaf at each node. In habitats where the plants are not crowded on open water, the floating leaves of *S. auriculata* are flat and do not overlap. However, when the plants become restricted for space, the floating leaves become folded along the midrib and stand suberect, closely set together. Sporocarps have only been observed on such compact forms and it appears that some factor associated with crowding is responsible for inducing sporocarp formation.

In South Africa, colonies of *S. auriculata* are known from the Cape Flats (Adamson, 1950), Gouna and Ruigtevlei in the Knysna area, and the species has been reported recently from the Baakens River in the Port Elizabeth district and from Ottos Bluff near Pietermaritzburg, Natal. The colony at Gouna, in a small pond near the forester's office, produces abundant sporocarps wherever the plants are closely compacted. In the Rhodesias, colonies of Salvinia have been known to occur in the backwaters of the Zambesi River, upstream from the Victoria Falls as far as Kazungula, for at least ten years. Within the last five years this Salvinia has appeared on open water in the Umtali and Rusapi districts as well as spreading rapidly on the newly formed Kariba Lake. Dr. H. Wild has also observed it growing in the spray zone of the Victoria Falls "rain" forest where it is perpetually drenched but not growing as a floating aquatic. All the Rhodesian material seen as yet is *S. auriculata.*

ORIGIN AND DEVELOPMENT OF SALVINIA POPULATIONS ON KARIBA LAKE

The presence of small patches of Salvinia on Kariba Lake was first reported in May, 1959, when the water level in the area had begun to rise. In view of the fact that *S. auriculata* had long been established on the Zambesi River above the Victoria Falls, it seems most probable that the population on Kariba Lake originated from plants carried over the Falls and downstream to Kariba. It is thought that the small and very buoyant plant body of Salvinia would enable it to survive carriage over the Falls and the passage through the turbulent waters of the Zambesi in the gorges below the Falls.

It is very probable that before the construction of the Kariba Dam, viable pieces of Salvinia, originating from the upstream colonies, were being carried over the Falls intermittently into the lower reaches of the Zambesi. However, if any such Salvinia plants formed a small colony in a quiet backwater it would most probably be flushed out of such a riverine habitat by periodic floods.

The construction of the Kariba Dam brought about a lacustrine habitat with an increasing area of water available for colonisation by floating aquatic plants and a corresponding decrease in the flushing effect of periodic floods. The stability of the new water surface was further enhanced by the gradual submergence of fairly closely spaced trees, whose partly submerged crowns damped wave action and reduced wind velocity about the water surface. It can also be expected that a significant increase in the nutrient level of the water would have occurred.

The development of large areas of sheltered water surface among partly submerged tree crowns favoured the explosively rapid vegetative reproduction of *S. auriculata* on the Lake during the spring of 1959.

In April, 1960, thirteen months after the plant was first reported from Kariba, the author estimated that the Salvinia mats covered an area of approximately 75 sq. miles. The estimate is based on a sketch map made of these mats during aerial reconnaissance of the Lake (Fig. 1). Recent reports indicate that in the twelve-month period subsequent to the author's visit, the Salvinia mats have extended to cover over 200 sq. miles of the surface of the Lake.

In April, 1960, the Salvinia mats were found to be almost confined to the upstream half of the Lake. Most of these mats occurred along the shoreline but a few discrete patches were observed on otherwise open water in the middle of the Lake. The comparatively low incidence of Salvinia between the Sengwe River estuary and Kariba at that time could have been due to the prevailing east to north-easterly winds checking downstream migration of Salvinia mats.

FREE-FLOATING SALVINIA MATS

Although it is postulated that the explosive spread of Salvinia in the spring of 1959 was favoured by the relatively sheltered habitats provided by partly submerged tree crowns, large populations observed in April, 1960, were floating free of any submerged trees. These free-floating Salvinia mats were often strikingly heterogeneous in that patches of old, sun-scorched, compacted, fertile Salvinia with sporocarps were distributed through a mat of much less compacted greener plants in the vegetative phase. As it is known that the compacted fertile form only occurs under conditions of crowding, it seems very probable that the free-floating mats are continually breaking up and re-forming. The small patches of sun-scorched, compacted fertile plants could well have originated from crowded colonies in sheltered estuaries which were partly broken up by floods in those tributaries. Alternatively, relatively old compacted colonies could have floated free of previously half submerged tree crowns as the water level rose.

There is some evidence that free-floating Salvinia mats are moved downstream by floodwaters entering the Lake. At the arrival of the "Barotse floods" during the author's visit, the passage between the Maze and Masumo Rivers was almost covered by an extensive Salvinia mat. On the return cruise twenty hours later the passage was almost clear of Salvinia at this point but a similar newly formed mat covered the passage a quarter of a mile downstream. During the aerial reconnaissance carried out shortly afterwards, down-current "tails" to mid-lake Salvinia colonies were observed, a phenomenon probably caused by surface downstream currents associated with these floodwaters.

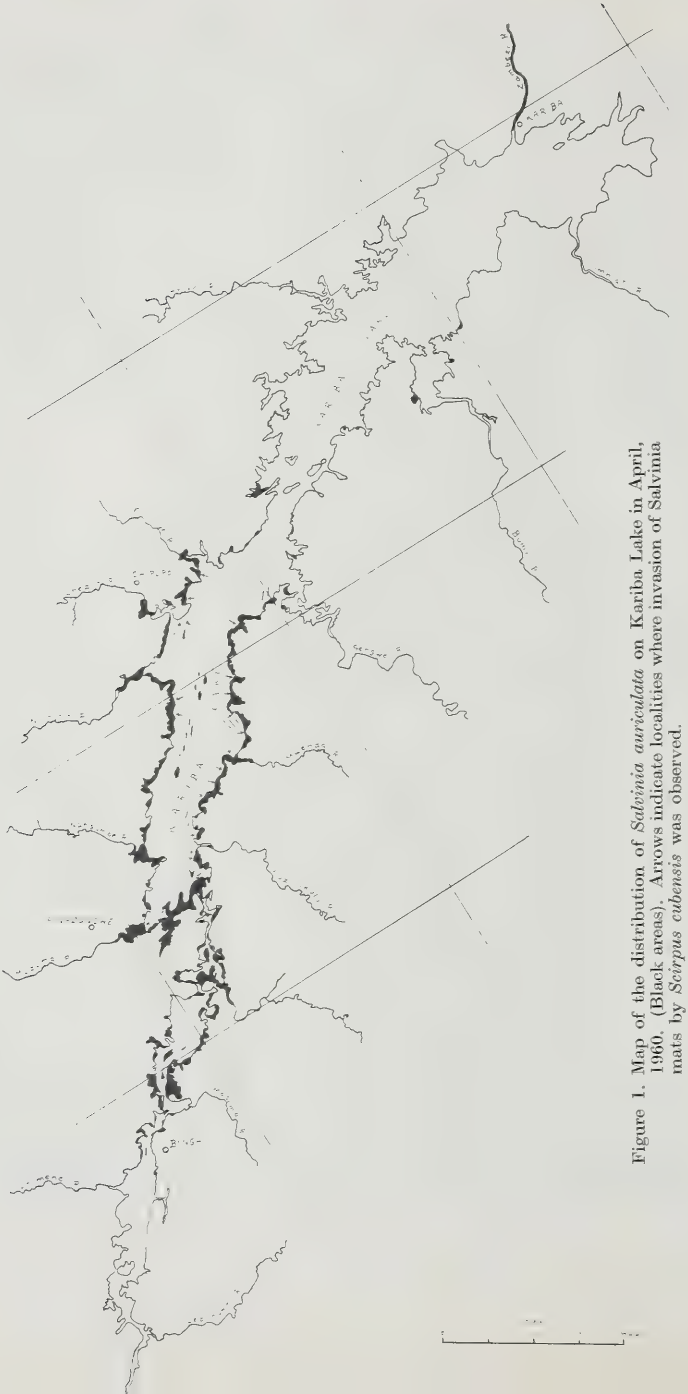
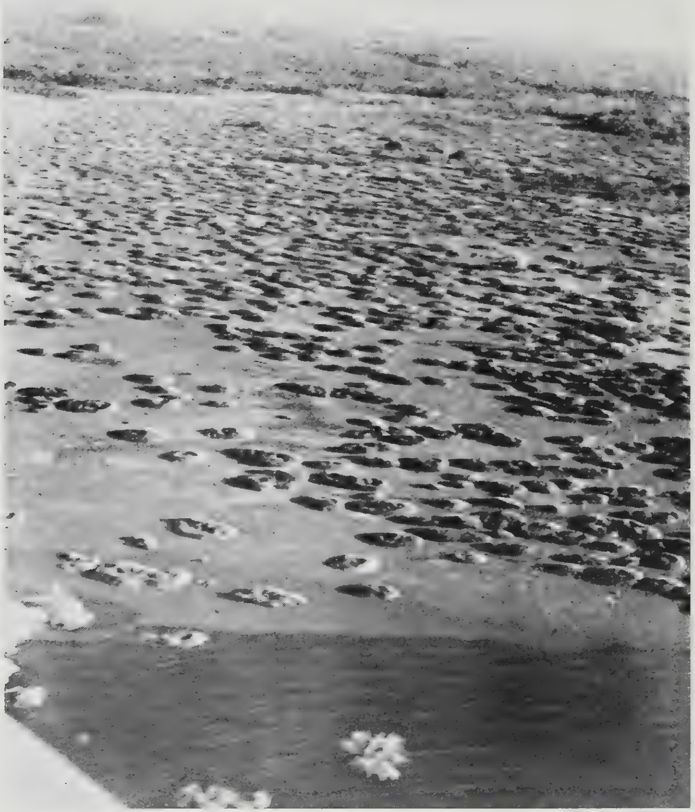


Figure 1. Map of the distribution of *Salvinia auriculata* on Kariba Lake in April, 1960. (Black areas). Arrows indicate localities where invasion of Salvinia mats by *Scirpus cubensis* was observed.



Aerial photograph of a partly stabilised Salvinia mat with domed colonies of *Scirpus cubensis* near the Luzilukulu River estuary. An emergent tree crown shows above the open water in the foreground. The wooded shoreline can be seen in the distance.

In the central third of the Lake, the free-floating Salvinia mats contained a well dispersed but relatively small number of plants of *Pistia stratiotes* L. and small colonies and individual young plants of *Scirpus cubensis* Poepp. & Kunth. Upstream from Binga, Salvinia was much less prominent or absent. However, in this uppermost portion of the Lake a few colonies of the aquatic grass *Vossia cuspidata* Griff. were found in mid-lake while *Pistia stratiotes* formed almost pure colonies among half submerged trees along the shore near the Chimene River estuary. Other aquatic plants observed in this part of the Lake included *Ceratophyllum demersum* L., *Lemna sp.*, *Utricularia stellaris* L.f. and *Utricularia thonningii* Schumach.

As a lack of protection from wind and wave action on the future of floating aquatic vegetation on the Lake could be of some economic consequence, the apparent effects of these factors on Salvinia and its associated species were noted after a storm on the Lake. The Salvinia exhibited no signs of damage but isolated plants of *Pistia* and *Scirpus cubensis* not associated with Salvinia mats had been blown over and slightly damaged.

STABILISED SALVINIA MATS

The greater part of both shorelines in the upper half of the Lake, from about the Sengwe River estuary to Binga, is lined with Salvinia mats which are more or less stabilised by the emergent branches of partially submerged trees. These mats vary considerably in the degree of compaction of the Salvinia plants. In more recently formed colonies the plants are only one layer thick. However, in some sheltered estuaries the Salvinia mats appear to have been undisturbed for a relatively long period and consist of several layers of compacted plants forming mats up to 15 cm. thick. The plants in such thick mats are usually sun-scorched and bear abundant sporocarps. Where the crowns of taller trees still stand above water, accumulations of fallen leaves lie on the mats under such emergent tree crowns. Stabilised mats are usually bordered on their lakeward margins by fringes of younger, greener Salvinia in the vegetative phase or by free-floating mats of varying widths.

An important biological phenomenon associated with the occurrence of thick Salvinia mats that have remained undisturbed for some time is the low oxygen content of the water below them. For example, in the Zongwe River estuary under such a mat, oxygen contents of the water near the surface and at a depth of one metre were 0·64 and 0·66 mg./l., respectively, as compared with 4·4 to 6·9 mg./l. in open water. Thus under undisturbed mats oxygen contents are close to the minimum oxygen requirements of some fish. Under thin, younger or disturbed mats oxygen contents of the water approach levels found in open water. Consequently the degree of deoxygenation seems to be related to the thickness of the mats and the period during which they have not been disturbed.

SUCCESSION ON STABILISED SALVINIA MATS

It has already been noted that free-floating Salvinia mats contain numbers of scattered individuals and small colonies of *Scirpus cubensis.* At various points along the shorelines in the central part of the Lake, stabilised Salvinia mats were being rapidly colonised by this Scirpus in April, 1960. This sedge sends out horizontal stolons among the spongy mass of submerged Salvinia leaves and produces leafy shoots at intervals along them. Eventually dome-shaped colonies are formed which may be scattered throughout the Salvinia mat (Plate I) or form a closed community a hundred metres wide, as was found between the Masanga and Chimburu Rivers.

A number of other aquatic angiosperms were also observed colonising and binding stabilised Salvinia mats. In the Chezia River estuary, a number of large plants of *Ludwigia adscendens* (L.) Hara were found sending out horizontal stems, over six metres long, which were rooting into the Salvinia mats. Other species which were also invading stabilised mats in this and other localities included *Ludwigia leptocarpa* (Nutt.) Hara, *Polygonum senegalense* Meisn., the grasses *Panicum repens* L. and *Echinochloa pyramidalis* (Lam.) Hitchc. & Chase, a species of Commelina and an unidentified sedge.

Although it was apparent that the invasion of the stabilised Salvinia mats was still in the early stages at the time of the author's visit, some of the larger Scirpus colonies appeared to have collapsed centres (Plate I). Unfortunately this phenomenon was only observed from the air and could not be investigated at close quarters.

It is possible that the succession will not proceed further when the Salvinia-Scirpus mats float clear of any submerged trees as the water level in the dam rises. Also, when the dam is full, it can be expected that offshore areas with partly submerged trees will support floating aquatic vegetation and that the succession in such areas will proceed at least to a closed Scirpus community. However, the recording of the further development of the aquatic vegetation on the Lake must be left to future investigators.

ACKNOWLEDGMENTS

The author wishes to thank the Kariba Lake Co-ordinating Committee for the opportunity and means of conducting this survey. Thanks are also due to Mr. Harding of J.A.F.O. for hydrobiological data, to Mr. J. Phipps of the Government Herbarium, Salisbury, for plant identifications and to other officials in the Federation for data and discussion of the problem.

References

ADAMSON, R. S., 1950. Pteridophyta in Flora of the Cape Peninsula. Cape Town.

HERZOG, R., 1935. Ein Beitrag zur Systematik der Gattung Salvinia. Hedwigia, **74** : 257–284.

WILLIAMS, R. H., 1956. *Salvinia auriculata* Aubl.; the chemical eradication of a serious aquatic weed in Ceylon. Tropical Agriculture, **33** : 145–158.

THE APPLICATION OF THE NAME *PROTEA REPENS*

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ABSTRACT

The National flower of South Africa, the "Sugar-bush" which for 180 years has been known as *Protea mellifera* Thunb. must revert to its original name *P. repens* (Linn.) Linn. and *P. repens* Thunb. becomes *P. scorzonerifolia* (Salisb. ex Knight) Rycroft comb. nov.

The synonymy of both species and a selected list of localities and collectors are cited.

In the Species Plantarum, ed. i, ii and iii (1753, 1762, 1764) Linnaeus listed "Leucadendron foliis lanceolatis, floribus oblongis, calycum squamis glabris" etc., to which he applied the epithet "repens". The species included a variety "β" and the descriptions of the two portions were based on descriptions and illustrations by Boerhaave (1720) and cited by Linnaeus. When comparing the two plates published by Boerhaave one can see a certain similarity. One shows a very short stem and Linnaeus was not incorrect in assuming that it had a creeping habit, hence the name "repens".

There is no doubt that the "var. β" is the *Protea repens* of all authors commencing with Thunberg (1781) whilst the other portion, the "Sugar-bush" or "Suikerbos" of the Cape, and the national flower of South Africa became *P. mellifera* Thunb.

In effect, Thunberg selected the "var. β" as the type of the name *P. repens*, no doubt on account of the greater suitability of this epithet for the species. The arborescent, melliferous "Sugar-bush" he very appropriately named *P. mellifera* and cited *Leucadendron repens* α of Linnaeus in synonymy.

It is certain, however, that Linnaeus deliberately applied the epithet "repens" to the "Sugar-bush" which he recognisably described in his Mantissa Altera as *Protea repens* ten years before Thunberg named it *P. mellifera*. There is also a reference in synonymy to the earlier *Leucadendron repens* of the Species Plantarum and the phrase "Caulis arborescens" is used.

Under these circumstances it is not possible to accept Thunberg's retypification of 1781 and it is unfortunate that the well-known *Protea mellifera* must now be named *P. repens*.

After Thunberg applied the appropriate but unacceptable epithet "repens" to the creeping species the first to use a substitute name was Salisbury who called it *Erodendrum scorzoneraefolium.* In his description of the species he states that it is "found abundantly in the sandy plains near Constantia". As far as is known, the species has never been collected in this locality and it seems that he repeated the error made by Boerhaave. The specific name must be transferred to the genus Protea and the new combination is thus *Protea scorzonerifolia* (Salisb. ex Knight) Rycroft.

The white form of *P. repens* (L.) Linn. is not regarded as a variety as described by Andrews (1809) for the reason that the colour of the involucral bracts varies in all shades from red to white. This colour variation occurs in many other species of Protea as well and the recognition of colour varieties would lead to confusion.

Similarly Meisner's varieties *major* and *minor* of *P. repens* Thunb. are not upheld because they grade into one another.

The synonymy involved is as follows:—

PROTEA REPENS (Linn.) Linn. non Thunb.

Protea repens *Linn.* Mant. alt. 189, No. 5 (1771), Syst. Veg. (ed. *Murr*) ed. XIII, 118 (1774); *Houtt.* Handl. Plant. Kruid. iv, 103 (1775); *Reichard* Syst. Plant. i, excl. var. *β.* (1779).

Leucadendron repens *Linn.* Sp. Plant. ed. I, i, 91, excl. var. *β.* (1753), Syst. Nat. ed. X, ii, 887 (1759), Sp. Plant. ed. II, 135, excl. var. *β.* (1762), Sp. Plant. ed. III, i, 135, excl. var. *β.* (1764); *Berg.* Vet. Akad. Handl. Stockh. 1766, 322 (1766); *Linn.* Syst. Nat. ed. XII, ii, 110 (1767); *Burm. f.* Prodr. Fl. Cap. 3, excl. var. (1768).

Protea mellifera *Thunb.* Diss. Prot. 34, 52 (1781); *Murr.* Syst. Veg. ed. XIV, 139 (1784); *Ait.* Hort. Kew. ed. I, i, 127 (1789); *Gml.* Syst. Nat. ed. XIII, ii, 223 (1791); *Lam.* Ill. Gen. i, 236 (1792); *Thunb.* Prodr. Fl. Cap. 26 (1794); *Curtis* Bot. Mag. t. 346 (1796); *Salisb.* Prodr. Stirp. Hort. Chapel Allert. 49 (1796); *Willd.* Sp. Plant. ed. IV, i, 522 (1798); *Kerner* Hort. Sempervir. iv, t. 44 (1799); *Wendl.* Hort. Herrenh. Pl. Rar. iii, 3, t. 13 (1800); *Mirbel* Hist. Nat. Plant. xi, 196, 202, t. 59 (1804); *Poir.* Encycl. Meth. v, 646 (1804); *Persoon* Syn. Plant. 115 (1805); *Dietr.* Bollst. Lex. Gart. Bot. vii, 541 (1807); *Maser* in Allg. Teutsch. Gart. Mag. iv, 137 (1808); *R. Brown* in Trans. Linn. Soc. x, 84 (1810); *Ait.* Hort. Kew. ed. II, i, 190 (1810); Allg. Teutsch. Gart. Mag. vii, 458, t. 46 (1810?); *Thunb.* Fl. Cap. ed. I, 484 (1813); *Poir.* Encycl. Meth. Bot. Suppl. iv, 565 (1816); *Breit.* Hort. Breit. 382 (1817); *Roem. et Schult.* Syst. Veg. iii, 348 (1818); *Thunb.* Fl. Cap. ed. II, 484 (1818); *Sweet* Hort. Sub. Lond. 20 (1818); *Link* Enum. Plant. Alt. i, 112 (1821); *Steud.* Nomencl. Bot. ed. I, 659 (1821); *Thunb.* Fl. Cap. ed. Schult. 132 (1823); *Spreng.* Syst. Veg. ed. XVI, i, 462 (1824); *Poir.* in Dietr. Sci. Nat. xliii, 388 (1826); *Roem. et Schult.* Syst. Veg. iii, Mant., 264 (1827); *Sweet* Hort. Brit. 346 (1827); *Desfont.* Cat. Plant. Hort. Reg. Paris 66 (1829); *Loud.* Encycl. Plant. 80 (1829), Hort. Brit. 38 (1830); *Steud.* Nomencl. Bot. ed. II, ii, 400 (1841); *Endl.* Mant. Bot. Gen. Plant. Suppl. ii, 77 (1842); *Roupell* Cap. Flow. t. 7 (1849); *Meisn.* in DC. Prodr. xiv, 239 (1856); *Regel* Cat. Plant. 116 (1860); *Pappe* Fl. Cap. Med. Prodr. ed. III, 34 (1868); *André* in Rev. Hort. Paris 308 cum ic. (1903); *Engler* in Notizblatt. Bot. Gart. Berlin App. xi, 12 cum ic. (1903); *Knuth.* Handb. Blutenbiol. III, i, 246 (1904); *Sim* For. Fl. Cap. Col. 296, t. 127 (1907); *Phill. et Stapf* in Dyer Fl. Cap. v, i, 576 (1912); *Sim.* Flow. Trees and Shrubs in S. Afr. 185, t. 1 (1919); *Sim* Nat. Timbr. Tr. S. Afr. 104 (1921); *Fairbridge* Gard. S. Afr. t. 27 (1924); *Bolus* Sec. Book S. Afr. Flow. 93 cum ic. (1936); *Phillips* in Fl. Pl. S. Afr. xxiv, t. 936 (1944); *Adamson et Salter* Fl. Cap. Pen. 324 (1950); *Kidd* Wild Flow, Cap. Pen. t. 34 (1950); *Luckhoff* Table Mtn. t. 17 (1951); *Rice et Compton* Wild Flow. Cape Good Hope t. 142 (1952); *Eliovson* S. Afr. Flow. Gard. 265 cum ic. (1955); *Sheat* St. Gard. Prac. S. Afr. 173 cum ic. (1956); *Vogts* Prot. 71, t. 20 (1958).

P. mellifera var. albiflora *Andr.* Bot. Rep. t. 582 (1809); *Phill. et Stapf* in Dyer Fl. Cap. V, i, 576 (1912).

P. mellifara var. albiflos *Kerner* Hort. Sempervir. xlv, t. 534 (1809?).

P. mellifara var. alba *Sweet.* Hort. Brit. 346 (1827); *Loud.* Hort. Brit. 38 (1830).

Erodendrum mellifluum *Salisb. ex Knight* Prot. 34 (1809).

Scolymocephalus mellifer *O. Kuntze* Rev. Gen. Plant. iii, 280 (1893).

Pre-Linnaean Citations

Scolymocephalos Afric. foliis angustis *etc. Raii* Hist. Plant. iii, Lib. xxv, 9 (1704) ex R. Br. l.c.

Conifera Alypi folio seminibus pennatis *etc. Sloane* in Philos. Trans. xvi, 666 cum ic. ex R. Br. l.c.

Lepidocarpodendron; foliis angustis, brevioribus *etc. Boerk.* Ind. Plant. Hort. Lugd. Bat. ii, 187, t. 187 (1720).

Scolymocephalus Africana, foliis longis acutioribus hirsutis, cono mellifero *Herm.* Cat. Pl. Afric. 20 (1737) ex R. Br. l.c.

Protea caule multifloro calycibus oblongis *etc. Roy.* Lugd. Bat. 185 (1740).

Scolymocephalus seu Lepidocarpodendron foliis saligno *Weinm.* Phyt. iv, 289, t. 896 (1745).

The holotype is the figure by Boerhaave (Ind. Plant. Hort. Lugd. Bat. ii, t. 187, 1720). In the Linnaean Herbarium in London there is a specimen marked "repens" in Linnaeus' handwriting. It was probably seen by Linnaeus after he had named the species in 1753. Had the specimen been in his possession when Species Plantarum was written he would have observed that the plant did not have a creeping habit and would probably not have named it "repens".

PROTEA SCORZONERIFOLIA (Salisb. ex Knight) Rycroft. comb. nov.
Erodendrum scorzoneraefolium *Salisb. ex Knight* Prot. 44, n. 24 (1809).
Leucadendron repens *β. Linn.* Sp. Plant, ed. I, 92 (1753), ed. II, 135 (1762), ed. III, i, 135 (1764); *Burm. f.* Prod. Fl. Cap. 3 (1768).
Protea repens *β. Reichard* Syst. Plant. i, 262 (1779).
Protea repens *Thunb.* Diss. Prot. 34, 52 (1781); *Murr.* Syst. Veg. ed. XIV, (1784); *Gml.* Syst. Nat. ed. XIII, ii, 223 (1791); *Lam.* Ill. Gen. i, 236 (1792); *Thunb.* Prodr. Pl. Cap. 26 (1794); *Willd.* Sp. Plant. ed. IV, i, 523 (1798); *Mirbel* Hist. Nat. Plant. 202 (1804); *Poir.* Encycl. Meth. v, 646 (1804); *Persoon* Syn. Plant. i, 115 (1805); *Dietr.* Bollst. Lex. Gart. Bot. vii, 548 (1807); *Maser* in Allg. Teutsch. Gart. Mag. iv, 138 (1808); *Ait.* Hort. Kew. ed. II, i, 193 (1810); *R. Brown* Trans. Linn. Soc. x, 92 (1810); *Thunb.* Fl. Cap. ed. I, 486 (1813); *Poir.* Encycl. Meth. Bot. Suppl. iv, 566 (1816); *Roem. et Schult.* Syst. Veg. iii, 353 (1818); *Thunb.* Fl. Cap. ed. II, 486 (1818); *Steud.* Nomencl. Bot. 660 (1821); Thunb. Fl. Cap. ed. Schult. 132 (1823); *Spreng.* Syst. Veg. i, 463 (1824); *Poir.* in Dict. Sci. Nat. xliii, 388 (1826); *Sweet* Hort. Brit. 347 (1827); *Loud.* Encycl. Plant. 80 (1829), Hort. Brit. 38 (1830); *Steud.* Nomencl. Bot. ed. II, ii, 401 (1841); *Endl.* Mant. Bot. Gen. Plant. Suppl. ii, 77 (1842); *Loud.* Hort. Brit. ed. ii, 38 (1850); *Meisn.* in DC. Prodr. xiv, 242, incl. vars. minor and major, but excl. ref. to Gueinzius (1856); *Phill. et Stapf* in Dyer Fl. Cap. V, i, 599 (1912).
Erodendrum staticifolium *Salisb. ex Knight* Prot. 45 (1809).

PRE-LINNAEAN CITATIONS

Lepidocarpodendron: foliis longissimis angustissimis *etc. Boerh.* Ind. Plant. Hort. Lugd. Bat. ii, 190, t. 190 (1720).
Protea caule unifloro calyce oblongo, foliis linearibus longissimis *Roy.* Lugd. Bat. 185 (1740).
Scolymocephalus seu Lepidocarpodendron foliis longissimis *Weinm.* Phyt. iv, 290, t. 89 7a (1745).

Leucadendron foliis longissimis, obtuse trigonis *etc. Wachend.* Ultraj. Hort. Ind. 204 (1747).

The holotype is the figure by Boerhaave (Ind. Plant. Hort. Lugd. Bat. ii, t. 190).

DISTRIBUTION

P. repens (L.) Linn. non Thunb.

CALVINIA: Nieuwoudtville, *Galpin* 10510 (PRE, K), *Schmidt* 548, 549 (PRE).

CERES: Eikenboshoek Mts., *Marloth* 9125 (PRE), Gydo Pass, *Rycroft* 2117 (NBG), Witzenberg Mts., *Rycroft* 1960 (NBG).

TULBAGH: Michell's Pass *Rycroft* 1273 (NBG).

HOPEFIELD: near Hopefield, *Bachman* 1789 (Z).

WELLINGTON: Bainskloof, *Grant* 2304 (MO).

PAARL: Frenchhoek, *Phillips* 1264 (SAM).

BELVILLE: Tigerberg, *Bowie* (BM).

CAPE: Devils Peak, *Ecklon* 654 (E, G, K, P), *Pillans* 10073 (MO), Lion's Head, *Dümmer* 45, 1361 (E), Table Mtn., *MacOwan Herb. Norm. Aust. Afr.* 783 (BM, BOL, G, K, P, UPS, Z), *Thunberg* (S), *Rob & Fries* 3169 (UPS), Signal Hill, *Phillips* 269 (K).

WYNBERG: between Wynberg & Constantia, *Burchell* 810 (K), Diep River, *Wolley Dod* 1232 (K), Cape Flats, *Schlechter* 790 (B, BM, FI, G, P, Z), Rondebosch, *Bonomi* (FI), Wynberg, *Roxburgh* 27 *in herb. Lambert* (G), Claremont, *Kassner* 1264 (E).

SIMONSTOWN: Simons Bay, *Wright* (K), Simonstown, *Sim* 2565 (PRE).

STELLENBOSCH: Stellenbosch Mt., *Lotsy & Goddijn* 1445 (L), Jonkershoek, *Rycroft* 1274 (NBG).

SOMERSET WEST: Kogel Bay, *Werdermann & Oberdieck* 274 (B), Steenbras, *Box* 3423 (BM).

CALEDON: Stanford, *Rycroft* 1770 (NBG), Kaaimansgat, Villiersdorp, *Rycroft* 2230 (NBG).

WORCESTER: Chavonnesberg, *Andreae*, 836 (PRE), Worcester, *Cooper* 1592 (BM, K).

MONTAGU: Koo, *Rycroft* 2082 (NBG).

SWELLENDAM: Bushman's Riv., *Barker* 1210 (NBG), Barrydale, *Galpin* 4455 (PRE), Swellendam, *Mund* (K).

LADISMITH: Rooiberg, *Wurts* 1283 (NBG), Seven Weeks Poort, *Barker* 5462 (NBG).

RIVERSDALE: Albertinia, *Rycroft* 1890, 2275 (NBG), Garcias Pass, *Barker* 5531 (NBG).

MOSSEL BAY: Mossel Bay, *Rogers* 4167 (SAM).

PRINCE ALBERT: Klein Swartberg, *Andreae* 1265 (PRE).

WILLOWMORE: Aasvogelberg, *Andreae* 969 (PRE).

UNIONDALE: Longkloof, *Fourcade* 2107 (K, PRE).

PORT ELIZABETH: Loerie, *Long* 1179 (K).

ALEXANDRIA: Zuurberg, *Long* 1153 (K).

ALBANY: Bothasberg, *MacOwan* 771 (K, S, SAM), Grahamstown, *Zeyher* 3663 (BOL, FI, S, Z.).

BATHURST: Coombs, *Sidey* 3079 (S).

WITHOUT LOCALITY: "repens" (LINN), *Banks in herb Smith* (LINN), *Drege* (B, G-DC, K, L, MO, P, S), *Niven in herb Martii* (BR), *Sieber* 2 (BR, G-DC, K, M, S), *Thunberg* (BM, SBT, UPS).

Although herbarium specimens cannot be cited, it is known that the species occurs also in the districts of Clanwilliam, Piketberg, Malmesbury, Bredasdorp, Heidelberg, Oudtshoorn, George, Knysna and Humansdorp.

P. scorzonerifolia (Salisb. ex Knight) Rycroft.

PAARL: Frenchhoek, *Niven* (K), Groot Drakenstein Mts., *Buller* (BOL, PRE).

BELVILLE: Hercules Pillar, *Salter* 5633 (BM, BOL, K), Joostenberg, *Rycroft* 1554 (NBG).

SOMERSET WEST: Upper Lourens River Valley, *Parker* 3855 (BOL, K), Vergelegen, *Lewis* 5669 (NBG).

WORCESTER: by the Breede River, near Darling Bridge, *Bolus* 5230 (BOL, K), du Toitskloof *Drege* (B, CGE, K, S).

PORT ELIZABETH: Algoa Bay, *Cooper* 3067 (K), wrong locality?

WITHOUT LOCALITY: *Drege* (B, BM, G, L, LD, P), *Niven* 68 (PH), *Roxburgh in herb. Lambert* (G), *Thunberg* (S, SBT, UPS).

ACKNOWLEDGEMENTS.

Grateful thanks are due to the Royal Society and Nuffield Commonwealth Foundation and to the Cape Tercentenary Foundation for grants which enabled me to visit herbaria in Britain and in Europe.

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Thanks are also due to the following herbaria for loan of material for study at Kirstenbosch: Amsterdam, Brussels, Halle, Leningrad, Gröningen, München, Missouri, Philadelphia.

In particular am I thankful to Mr. A. A. Bullock of Kew, Dr. W. T. Stearn of the British Museum of Natural History and to Dr. G. Buchheim of Berlin for valuable discussions dealing with the nomenclature of these and other species.

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SOME AQUATIC HYPHOMYCETES IN SOUTH AFRICA

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(With Plates XXVII—XXIX)

ABSTRACT

Eighteen species of aquatic hyphomycetes growing on decaying leaves in running streams are described. Sixteen of these can be assigned to known species and the other two are new species of *Articulospora* and *Anguillospora* and are described in this paper. Notes on spore development in ten species, general notes on ecology and a key to these fungi are given.

INTRODUCTION

Many species of aquatic hyphomycetes common to Europe (Ingold 1942 and later papers), California (Ranzoni 1953) and Jamaica (Hudson and Ingold 1960) have been recorded for the first time from South Africa. Some of these have also been recorded from Uganda and Rhodesia (Ingold 1958), Nigeria (Ingold 1956 and 1959) and Ghana (Dixon 1959).

Table I records the fungi found in the Eastern Cape Province of South Africa, their distribution within the localities and the nature of the material on which they were growing. Unless otherwise indicated, the substrate was a decaying leaf.

TABLE I.	GRAHAMSTOWN DISTRICT.														near ALICE		HOGSBACK																PORT ELIZABETH	
	Fern Kloof	Featherstone Kloof	Belmont Valley		Paradise Kloof					Howiesons Poort					Tyumie River		Plantation	Plantation					Natural Forest										Baakens River	
	Unidentified leaf	Quercus robur	Populus nigra	Quercus robur	Ocotea bullata	Cassine sp.	Canthium bispinosum	Celtis africana	Rapanea melanophloeos	Rhus legati	Unidentified leaf	Rapanea melanophloeos	Burchellia bubalina	Ficus capensis	Combretum caffrum	Salix babylonica	Populus serotina	Quercus robur	Eucalyptus globulus	Acacia sp. decaying fruit	Buddleja salvifolia	Rubus sp.	Plectranthus ecklonii	Celtis africana	Xymalos monospora	Rhus legati	Grewia occidentalis	Maytenus cymosus	Calodendrum capensis	Fagara davyi	Podocarpus latifolius	Polystichum sp.	Salix babylonica	Populus sp.
Lunulospora curvula		X	X		X	X		X		X				X	X		O	O	X			X		X	X			X					O	
Flagellospora penicillioides			Z																									X					O	
F. curvula															X							X			X	X				X	X			
Anguillospora filiformis							O	O	X	X																				X				
A. longissima			X																			X						X						X
Tricladium splendens																	X	X				X						X						
T. gracile			X														X	X	X		X	X		X		X	X	X			X			
Heliscus longibrachiatus																		X	X	X								X						
Clavariopsis aquatica			X	X													X	X		X		X												O
Tetracladium setigerum																	X											X						
T. marchalianum			X	X											X			X					X										ZX	
Articulospora inflata											X						X																	
A. tetracladia	X	X						X	X	X	X						X	X						X		X		X						
Articulospora grandis								X	X			X																						
Alatospora acuminata			O				X	X		X		X	X	X	X		X	X	X	X	X	X					X	X	X		X	X		
Triscelophorus monosporus			X					O		X		X	X		X					X														
Lemonniera aquatica																	X	X						X										
L. brachycladia																					X					X				X				

X—spore attached to conidiophore of fungus growing on leaf, etc.
O —free floating spore.
Z—culture of fungus on malt agar from free floating spores

METHODS

After collection the decaying leaves were placed in shallow dishes of water. Spore production ceased after about two days, but could be prolonged for about a week, if the leaves were placed in jars of water which was constantly aerated.

Spore development of fungi growing on decaying plant material has been followed in hanging-drop cultures. At first ordinary closed rings were used but in several cases under these conditions certain irregularities in the shape of the spores developed were observed. It was decided that this might be due to the development of anaerobic conditions and so rings with an inlet and outlet tube were used and air was passed through the ring for a few minutes approximately once an hour. Under these conditions spore development appeared to be quite normal. The drawings of developing spores and the other text figures were all made with the aid of a camera lucida.

Cultures of some of the fungi have been made by spraying spores onto the surface of 2% malt agar. When these spores had germinated, they were transferred to fresh plates of the same medium. It was found that the results were more successful, when stream water rather than distilled water was used in making the medium.

DESCRIPTION OF SPECIES AND SOURCES OF MATERIAL

The four main areas in which these fungi have been collected are the Grahamstown district, Port Elizabeth, the Hogsback in the Amatola Mountain Range and from near Alice. The sites within these main localities are as follows:—

1. **Grahamstown district:**

(*a*) A streamlet in an islet of natural forest in Fern Kloof on the south-facing slope of the hills south of Grahamstown.

(*b*) A stream, the headwaters of the Kowie River, in Featherstone Kloof below Fern Kloof. The stream at this site is overhung by oak trees.

(*c*) Blaaukrantz River, 5 miles from Grahamstown on the Belmont Valley Road. The stream is overhung by *Populus nigra* and *Quercus robur*. Decaying leaves of these trees are held back by rocks in the shallows, where the water is running swiftly.

(*d*) A small stream in Paradise Kloof, an islet of natural forest on a south-facing slope 6 miles from Grahamstown on the Highlands road.

(*e*) A tributary of the Palmiet River, in Howiesons Poort on the Port Elizabeth Road. The stream is overhung by indigenous trees and shrubs and by the exotic shrub *Acacia longifolia.*

2. The **Baakens River,** the Nature Reserve, Port Elizabeth:

(*a*) In a *Populus sp.* plantation. The fallen leaves are caught on sticks lying across the stream.

(*b*) Rocky shallows beneath trees of *Salix babylonica* below a weir.

3. The **Hogsback,** Amatola Range:

(*a*) Seven streams in natural forest on south-facing slopes, four in the lower forest and three in the upper forest.

(*b*) A streamlet running through a plantation of *Quercus robur.*

(*c*) A streamlet running through a plantation of *Populus serotina* (? *P. nigra x deltoides*). The fallen leaves lie on the surface of the mud with a trickle of water running over them.

(*d*) Two streams in mixed plantations of exotic trees. The fallen leaves are caught on sticks lying across the stream bed.

4. The **Tyumie River** 8 miles from Alice on the road to the Hogsback. Decaying leaves of *Combretum caffrum* and *Salix babylonica* are held up behind stones in the shallows, where the water is running rapidly.

Of the eighteen species found, all except two could be assigned to described species. The other two fungi are new species of *Articulospora* and *Anguillospora* and are described in this paper. All the descriptions of the known species, unless otherwise stated, are taken from Professor Ingold's publications.

Lunulospora curvula Ingold. (Plate XXVII, A.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore simple or sparingly branched, 50—200 μ long, 2—2·5 μ broad. Conidium (aleuriospore) produced terminally on a short stalk cell 3—5 μ long 1·5 μ broad. By repeated budding from the end of the conidiophore a number of spores may be produced in succession (but not basipetally), each seated on a stalk cell. Aleuriospore unicellular, crescent-shaped or sigmoid, 70—90 μ long, 4—5 μ broad in its middle region, tapering to 1·5 μ at its ends, with a row of conspicuous vacuoles. Attached at a point along its convex surface to the stalk cell. Liberated spore with an inconspicuous hilum where it was originally attached to the stalk cell.

"On submerged decaying leaves of *Alnus glutinosa* and *Salix sp.* from a stream in Leicestershire, England." (Ingold 1942).

Other records of *Lunulospora curvula* are from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960) and from Rhodesia (Ingold 1958). The fungus was found on submerged decaying leaves of *Celtis africana*, *Xymalos monospora*, *Maytenus cymosus*, *Eucalyptus globulus*, *Rubus sp.* and on a decaying fruit of *Acacia sp.* from the Hogsback, on decaying leaves of *Populus nigra* from the Belmont Valley, of *Quercus robur* from Featherstone Kloof, of *Rhus legati* from Howiesons Poort and of *Ocotea bullata*, *Cassine sp.* and *Celtis africana* from Paradise Kloof. Conidiophores were abundant in collections made in April and May but were much less common in June, July and August.

It was observed that there is a great variation in the length of conidiophore projecting from the leaf tissue. The length was 13 μ in the fungus growing on Oak leaves from Featherstone Kloof, whereas it was 50—80 μ in the fungus on Poplar leaves from the Belmont Valley.

Spore development was followed in hanging-drop cultures of the fungus growing on decaying leaves of *Populus nigra* and *Xymalos davyi* (Fig. 1).

While the development of the first spore is proceeding, the primordium of the second spore arises as a protuberance on the end of the conidiophore to one side of the first spore. Ingold (1942) observed that the protuberance was first cut off from the conidiophore by a septum and that a second septum was formed cutting off a small basal cell which is the stalk cell. These two septa were not, however, always apparent (see second septum Fig. 1, a, both septa Fig. 1, t). The spore primordium enlarges and elongates and after about three and a half hours a second growing point develops near its base (Fig. 1, h, i, p, q). Both growing points continue to grow until a crescent-shaped or sigmoid spore is developed (Fig. 1, g, h, t). The spore takes about six hours to develop at laboratory temperature as compared with ten hours observed by Ingold (1942). The spore is liberated by the breakdown of the stalk cell. Whereas Ingold (1942) observed the remains of the stalk cell were never left attached to the spore or the conidiophore, they have often been found attached to the conidiophore but not the spore (Fig. 1, t).

Flagellospora curvula Ingold. (Plate XXVII, B.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore usually branched forming a group of two to ten phialides. Each phialide clavate, 10—20 μ long, 2·5 μ broad, producing conidia (phialospores) in basipetal succession. Conidium curved or sigmoid, hyaline unicellular, 100—150 μ long, 2 μ broad in the middle region tapering to 1·5 μ towards its ends.

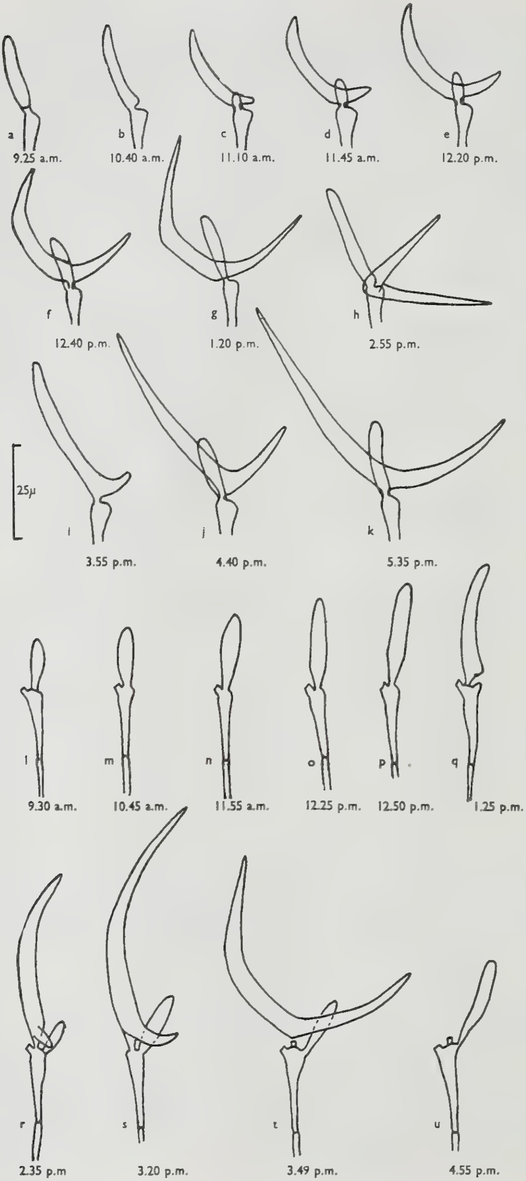

FIG. 1.—*Lunulospora curvula* Ingold. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Xymalos monospora.*

"On submerged decaying leaves of *Alnus glutinosa* and *Salix sp.* from a stream in Leicestershire, England". (Ingold 1942).

Other records of *Flagellospora curvula* are from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960), from Switzerland (Ingold 1949), from Ghana (Dixon 1959) and Rhodesia (Ingold 1958). This fungus has been found growing on submerged decaying leaves of *Xymalos monospora*, *Rhus legati*, *Fagara davyi* and *Podocarpus latifolius* and of *Rubus sp.* from the Hogsback and on skeletonised leaves of *Combretum caffrum* from the Tyumie River. This fungus was common in August but not from April to July.

Flagellospora penicillioides Ingold. (Plate XXVII, C.)

"Submerged aquatic fungus with branched, septate mycelium. Mycelium on malt agar hyaline at first, later bright brown with moniliform chains of inflated, oil-containing brown cells (chlamydospores) 15—35 μ long, 8—16 μ broad, occurring in the older parts of the aerial mycelium. Aquatic conidiophores hyaline, branched as in *Penicillium*: unbranched stalk part 150—300 μ long, 2·5 μ broad: apical phialides 8—40, 15—20 μ long, 2·5 μ broad. Conidia (phialospores) hyaline, 45—55 μ long, 2·5 μ broad, in the middle but tapering to 1·5 μ at the ends, unicellular or uniseptate, curved or more usually slightly sigmoid, produced in basipetal succession from the phialides. Aerial conidiophores produced sparingly on malt agar, resemble the aquatic conidiophores but produce heads of slimy conidia.

"On submerged decaying leaf from a stream near Reading, England". (Ingold 1944).

Flagellospora penicillioides has also been recorded from California (Ranzoni 1953) and from Jamaica (Hudson and Ingold 1960). This fungus was found in August growing on a submerged decaying leaf of *Maytenus cymosus* from the Hogsback and has been isolated in culture on malt agar from spores from the Belmont Valley. The cultural characteristics of this fungus agree with the description quoted above. However, spore production from strips of the culture placed in sterile water took three to four days to commence, whereas Ingold (1944) found that spores were produced within two days.

Anguillospora longissima (Sacc. & Syd.) Ingold. (Plate XXVII, D.)

"Submerged aquatic fungus with branched septate mycelium which is hyaline when young, becoming greenish grey when old. Conidiophore usually simple, 50—150 μ long, 2—4 μ broad. Conidium (aleuriospore) terminal, 200—350 μ long, 5—6 μ broad in middle region tapering to 3—4 μ broad at ends, 6—10 septate, curved or sigmoid, separating when mature by the breakdown of a 'small separating cell' at the end of the conidiophore. On submerged decaying alder and willow leaves, England." (Ingold 1942.)

Other records of *Anguillospora longissima* are from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960) and from Rhodesia (Ingold 1958). This fungus has been found growing on submerged leaf skeletons of *Maytenus cymosus* and of *Rubus sp.* from the Hogsback and of *Populus nigra* from the Belmont Valley and from Port Elizabeth. This fungus was absent from collections made in April but was present as a few isolated spores in May and increased in abundance from June to August.

Anguillospora filiformis n. sp. (Plate XXVII, E) (Fig. 2).

Submerged aquatic fungus, mycelium embedded in tissue of decaying leaf. Conidiophore simple, 3 μ broad, slightly inflated towards the apex Conidia (aleuriospores) terminal, elongate, septate, hyaline, 200—250 μ long, 3·8 μ broad. Sides of spore almost parallel, converging towards the apex. Small lateral outgrowth on side of spore near base, becoming more or less parallel with sides of spore.

Hab. On submerged decaying leaves from streams in the Eastern Cape Province of South Africa.

Anguillospora filiformis sp. nov.

Fungus aquaticus, submersus, mycelio in folio putrescenti inserto. Conidiophora simplicia 3 μ lata, subinde apice moderate inflata. Conidia (aleuriosporae) acrogena, elongata, septata, hyalina, 200—250 μ longa, 3·8 μ lata. Latera spori paene parallela, ad apicum alternata. Parvus processus lateralis prope ad basim spori situs, lateribus spori plerumque parallelus.

Hab. In folius putrescentibus, in fluminibus in orientale parte Capicae Provinciae Africae Australis submersis.

This species was found growing submerged on a decaying leaf of *Fagara davyi* from the Hogsback, on decaying leaves of *Rapanea melanophloeos* from Paradise Kloof and on an unidentified leaf from Howiesons Poort. Spores are common in the streams of Paradise Kloof and Howiesons Poort from June to August. The conidium of this fungus differs from that of *Anguillospora longissima*, *A. pseudolongissima* Ranzoni, and *A. gigantea* Ranzoni in that it is only 3·8 μ broad, whereas the conidia of the other three species are 5—6 μ, 4·6—6 μ and 5—6 μ broad respectively, it further differs from the other three in the presence of a lateral process at the base, an appendage which they lack. The sides of the conidium of this fungus are parallel for most of their length but in *A.*

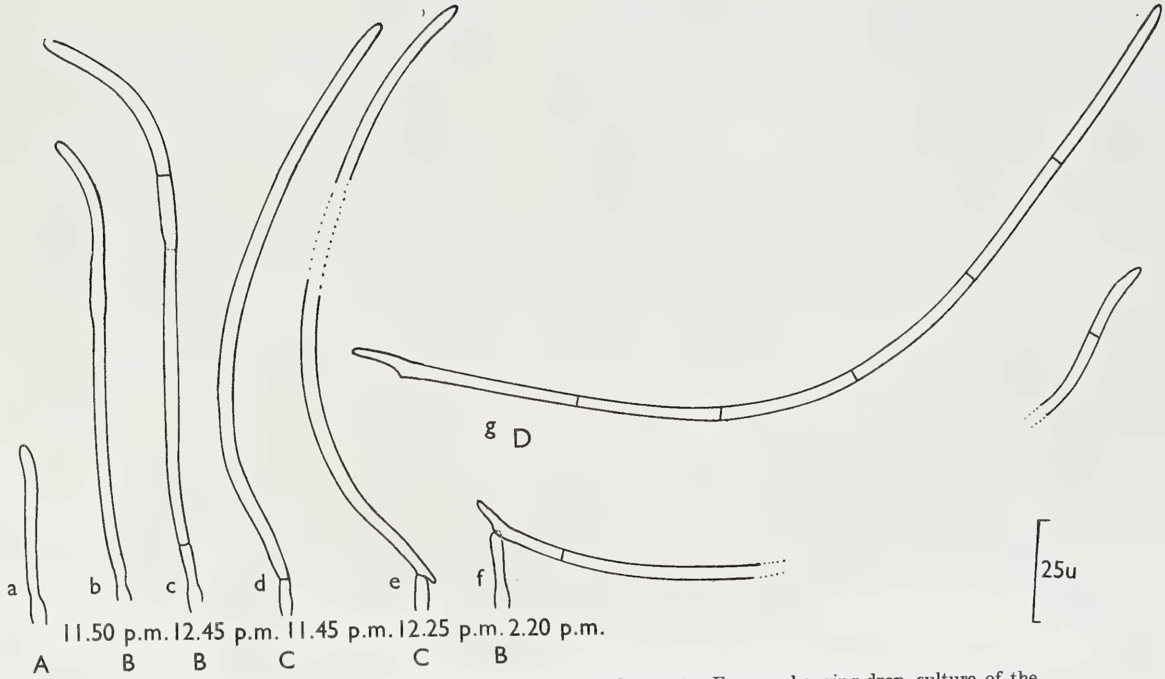

FIG. 2.—*Anguillospora filiformis* sp. nov. Spore development. From a hanging-drop culture of the fungus growing on a decaying leaf of *Rapanea melanophloeos*. Conidiophores with conidia (A, B and C) arranged in a developmental series. D. A mature spore after liberation.

flagellifera (Ingold) the conidium consists of two unlike portions, a truncate basal portion 10—14 μ broad and an upper whip-like portion.

Observations on spore development in *Anguillospora filiformis* have been made from hanging drop cultures of the fungus growing on leaf skeletons of *Rapanea melanophloeos.* A complete series of drawings of spore development for one spore has not yet been made but (Fig. 2) drawings of three spores (A, B and C) at various stages in development have been arranged in a developmental series. The spore primordium (Fig. 2, a) which is somewhat narrower than the inflated portion of the conidiophore elongates and becomes slightly broader in the upper half (Fig. 2, b). However, as the spore continues to elongate the sides become more or less parallel converging towards the apex (Fig. 2, d). A small knob-like process appears on the side of the spore immediately above the septum which has formed between the developing spore and the conidiophore (Fig. 2, c). This process elongates to form a short peg-like process which is about half as broad as the spore and which is orientated with its long axis almost parallel with the sides of the spore (Fig. 2, g). During its development the spore becomes septate. Liberation of the spore seems to be by the disintegration of the middle lamella between it and the conidiophore. It would appear that in reaching its full size and ultimate angle the process may assist in "pushing" the spore off the conidiophore. The spores germinate readily on 2 per cent malt agar.

Tricladium splendens Ingold. (Plate XXVII, F.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore usually simple. Conidium (aleuriospore) terminal, hyaline, consisting of a main axis, fusiform, 3—6 septate, 60—20 μ long, 6—7 μ broad at widest part, tapering to 2—3 μ at their apices, with a narrow isthmus, 2 μ wide, where each branch joins the main axis of the spore.

"The two branches originate from the main axis of the spore at levels 10—20 μ apart.

"On submerged decaying leaves of *Alnus glutinosa* from a stream in Leicestershire, England." (Ingold 1942.)

Tricladium splendens has also been recorded from California (Ranzoni 1953) and from Switzerland (Ingold 1949). This fungus has been found growing on submerged decaying leaves of *Populus serotina* and *Quercus robur*, *Maytenus cymosus* and of *Rubus sp.* from the Hogsback, where it was common in July and August, but was not found from April to June.

Spore development has been followed in a hanging-drop culture of this fungus growing on a decaying leaf of *Populus serotina* (Fig. 3).

The spore primordium develops as a club-shaped swelling at the end of a thin straight conidiophore from which it is cut off by a cross wall

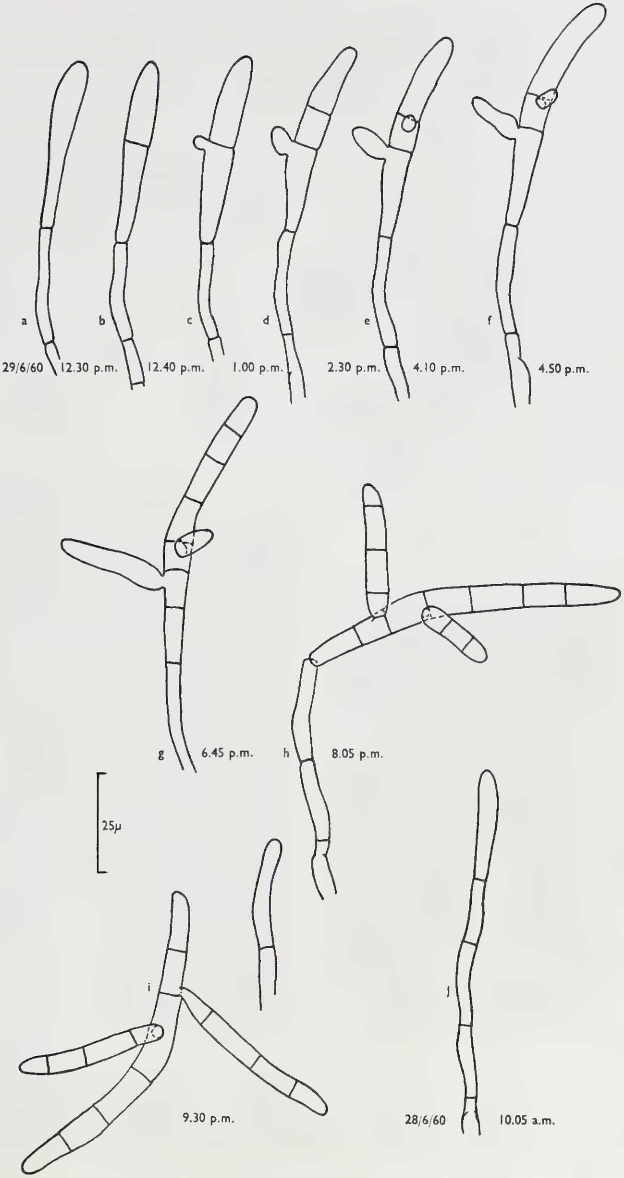

Fig. 3.—*Tricladium splendens* Ingold. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Populus nigra* var. *italica.*

(Fig. 1, a). As the primordium elongates it becomes slightly curved and a septum is formed about half-way along its length (Fig. 1, b). A protuberance which will form one of the lateral arms arises just below this septum and is constricted at its base (Fig. 1, c). A second septum forms a short distance above the first (Fig. 1, d) and a protuberance, which will form the second lateral arm, arises just below this septum and is constricted at its base (Fig. 1, e). The two lateral arms are never in the same plane. The main axis of the spore and the two laterals elongate and become further septate (Fig. 1, h). The spore is liberated by disjunction at the cross-wall separating it from the conidiophore. This pattern of development confirms that of Ingold (1942). After the first spore has been liberated the conidiophore elongates and a few cells are added to its length before another spore primordium is cut off in the same way as the first (Fig. 1, j). Spore development from the formation of the primordium to the liberation of the spore takes about eight hours. The spores germinate on 2 per cent malt agar.

Pure cultures of this fungus have been obtained by spraying spores on to the surface of 2 per cent malt agar and by transplanting them after germination. The characteristics of the culture agree with those described by Ingold (1942). The colony formed is compact with a dark olive-green central portion surrounded by a narrow white fringe. A considerable amount of dark olive-green aerial mycelium is produced. Conidia were produced when strips of culture were transferred to sterile stream water which was constantly aerated.

PLATE XXVII.

A. *Lunulospora curvula* Ingold. Conidiophore with two branches each bearing at its tip two young conidia, one almost mature and the other very young. Growing on decaying leaf of *Populus nigra* from the Belmont Valley. Mounted in acid fuchsin and lactophenol.

B. *Flagellospora curvula* Ingold. Two groups of conidiophores each consisting of a group of phialides. Spores on left young, that on right almost fully grown. Growing on decaying leaf of *Combretum caffrum* from Tyumie River. Mounted in water.

C. *Flagellospora penicillioides* Ingold. Conidiophore from culture of the fungus on 2 per cent malt agar. Mounted in water.

D. *Anguillospora longissima* (Sacc. & Syd.) Ingold. Conidiophore with conidium. Growing on decaying leaf of *Populus sp.* from the Baakens River. Mounted in water.

E. *Anguillospora filiformis* n. sp. Showing point of attachment of conidium to conidiophore and process at base of conidium. Growing on decaying leaf from the Hogsback. Mounted in water.

F. *Tricladium splendens* Ingold. Conidiophore bearing young conidium. Growing on decaying leaf of *Populus serotina* from the Hogsback. Mounted in water.

G. *Tricladium gracile* Ingold. Two conidiophores each bearing an immature conidium. Growing on decaying leaf of *Quercus robur* from the Hogsback. Mounted in water.

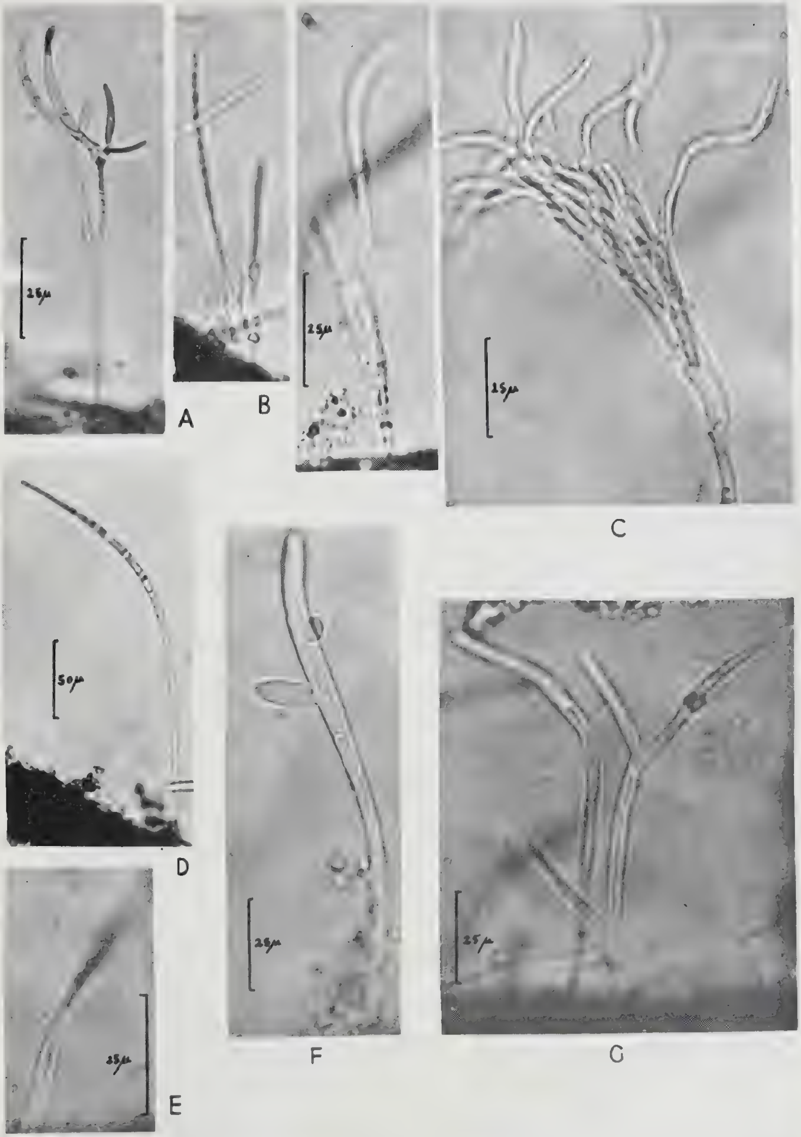

Plate XXVII

Tricladium gracile Ingold. (Plate XXVII, G.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore simple, hyaline, 10—50 μ long, 2—2·5 μ broad. Conidia (aleuriospores) terminal, solitary, hyaline, septate, branched, consisting of a main axis and two branches: main axis 90—150 μ long, 3·0—3·5 μ broad in basal half, but tapering to 1·5 μ towards the apex curved or bent to an obtuse angle at the point of origin of each lateral branch; branches straight, 50—80 μ long, 1·5 μ broad; distance between the points of origin of the two branches 14—18 μ. From submerged decaying leaves of oak from streams in Britain." (Ingold 1944.)

Other records of *Tricladium gracile* are from California (Ranzoni 1953). This fungus has been found on submerged leaf skeletons of *Populus serotina*, *Quercus robur*, *Eucalyptus globulus*, *Celtis africana*, *Rhus legati*, *Grewia occidentalis*, *Maytenus cymosus*, *Podocarpus latifolius*, *Rubus sp*. and of *Buddleja salicifolia* from the Hogsback and of *Populus nigra* from the Belmont Valley. This fungus was common in collections made in April and May and was abundant in July and August.

The fungus has been isolated on 2 per cent malt agar by spraying spores on a malt-agar plate and by subsequent sub-culturing on the same medium. The colony formed on malt agar is compact, zoned and the reverse side is a dull bluish grey at first, becoming greyish brown with age. There is a narrow white to cream border and patches of yellow staining are sometimes present. A considerable amount of light grey aerial mycelium is produced in the dark central region. When strips of the culture were transferred to sterile stream water which was constantly aerated, spores were produced but not abundantly. The conidiophores and conidia which arose from the dark cells of the old mycelium were colourless and agreed exactly with those formed in nature.

Clavariopsis aquatica De Wild. (Plate XXVIII, AB.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore usually simple, 50—250 μ long, 2—2·5 μ broad. Conidium (aleuriospore) terminal consisting of a broadly clavate, two-celled main part, 30—40 μ long, 3—4 μ broad at the base widening to 12—14 μ broad at the apex, with three long divergent processes 50—70 μ long, 1·5—2 μ broad, developed from its truncate apex." (Ingold 1942.)

In addition to this record from England, *Clavariopsis aquatica* has been recorded from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960) and from Rhodesia (Ingold 1958). This fungus has been found on submerged skeletonised leaves of *Populus serotina*, *Quercus robur*, *Xymalos monospora* and *Rubus sp*. and on a decaying fruit of *Acacia sp*. from the Hogsback and on *Populus nigra* and *Quercus robur*

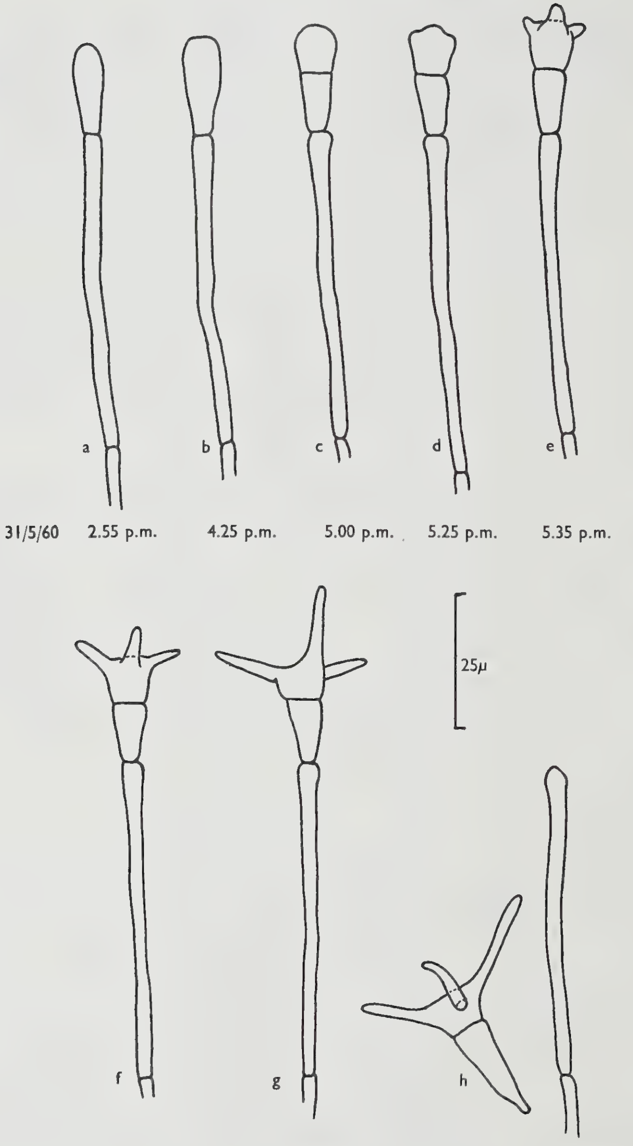

FIG. 4.—*Clavariopsis aquatica* de Wild. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Populus nigra*.

from the Belmont Valley. Spore development has been followed in hanging-drop cultures of the fungus on decaying leaves of *Populus nigra* (Fig. 4). The tip of the conidiophore swells up and a cross-wall is formed cutting off a clavate spore primordium (Fig. g 4, a). A septum forms about half-way along the length of the primordium dividing it into two cells (Fig. 4, c). Three bulges which will form the three long divergent processes appear at the distal end of the upper cell (Fig. 4, d). The spore is fully developed (Fig. 4, g) one to two hours later and is liberated by a rounding off of the two layers of the cross-wall between the spore and the conidiophore (Fig. 4, h). This pattern of development closely resembles that described by Ingold (1942). It would appear that the formation of the cross-wall which divides the spore into two cells may either take place before or after the divergent arms have started to develop. In Ingold's drawings (1942) the wall is not present until after the divergent arms are quite well developed but in this case in all the spores examined the wall was formed before the divergent arms started to develop. Some spores collected from the Belmont Valley had four divergent arms.

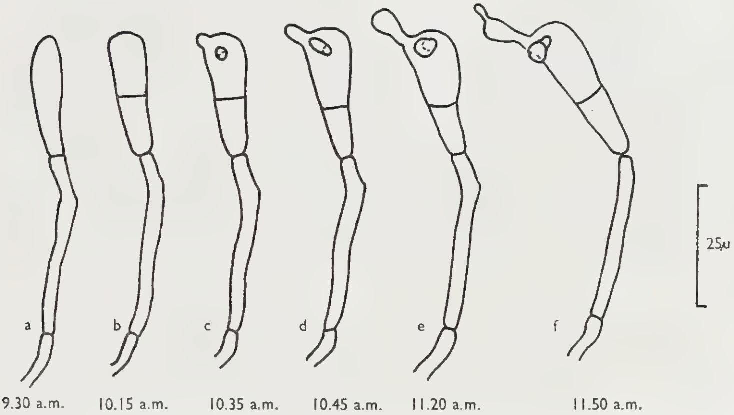

FIG. 5.—*Clavariopsis aquatica.* Abnormal spore development. From a hanging-drop culture of the fungus growing on a decaying leaf of *Populus nigra.*

Two of the spores observed in the hanging-drop culture, over a closed ring, developed abnormally. One of the spores formed was a simple two-celled spore with a small apical projection (Fig. 5) and the other had two short inflated arms, instead of the normal three long divergent arms, and one of these had a secondary process (Fig. 6).

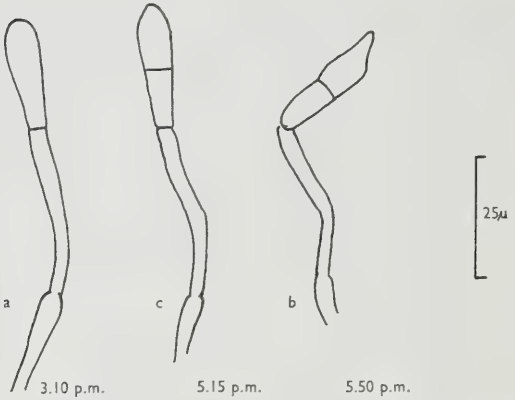

FIG. 6.—*Clavariopsis aquatica.* Abnormal spore development from hanging-drop culture of the fungus growing on a decaying leaf of *Populus nigra.*

The fungus has been isolated on 2 per cent malt agar by spraying spores on to a malt-agar plate and by subsequent sub-culturing on the same medium. The characteristics of the culture agree with those described by Ingold (1942). The colony formed is compact, with a considerable growth of white aerial mycelium over the whole colony. The reverse is dark olive-green with an irregular white fringe. When a strip of colony was transferred to water which was constantly aerated, conidiophores and conidia, which agreed exactly with those formed in nature, were produced from the dark cells of the old mycelium.

Heliscus longibrachiatus Ingold. (Plate XXVIII, C.)

"Aquatic fungus with branched septate mycelium. Conidiophores and conidia developed below water. Conidia usually simple, consisting of a simple phialide 10—20 μ long, 1·5 μ broad at the base widening to 4·0 μ at the apex, with three straight divergent arms 15—25 μ long, 1·0—1·5 μ broad arising from a truncate apex. Conidia unicellular produced in basipetal succession.

"On decaying leaves of *Alnus glutinosa* from a stream in Leicestershire, England". (Ingold 1942). *Heliscus longibrachiatus* has been found growing on skeletonised leaves of *Populus serotina, Quercus robur* and *Eucalyptus globulus* and on a decaying fruit of *Acacia sp.* from the Hogsback. This fungus was only abundant on leaves of *Eucalyptus globulus* collected in August.

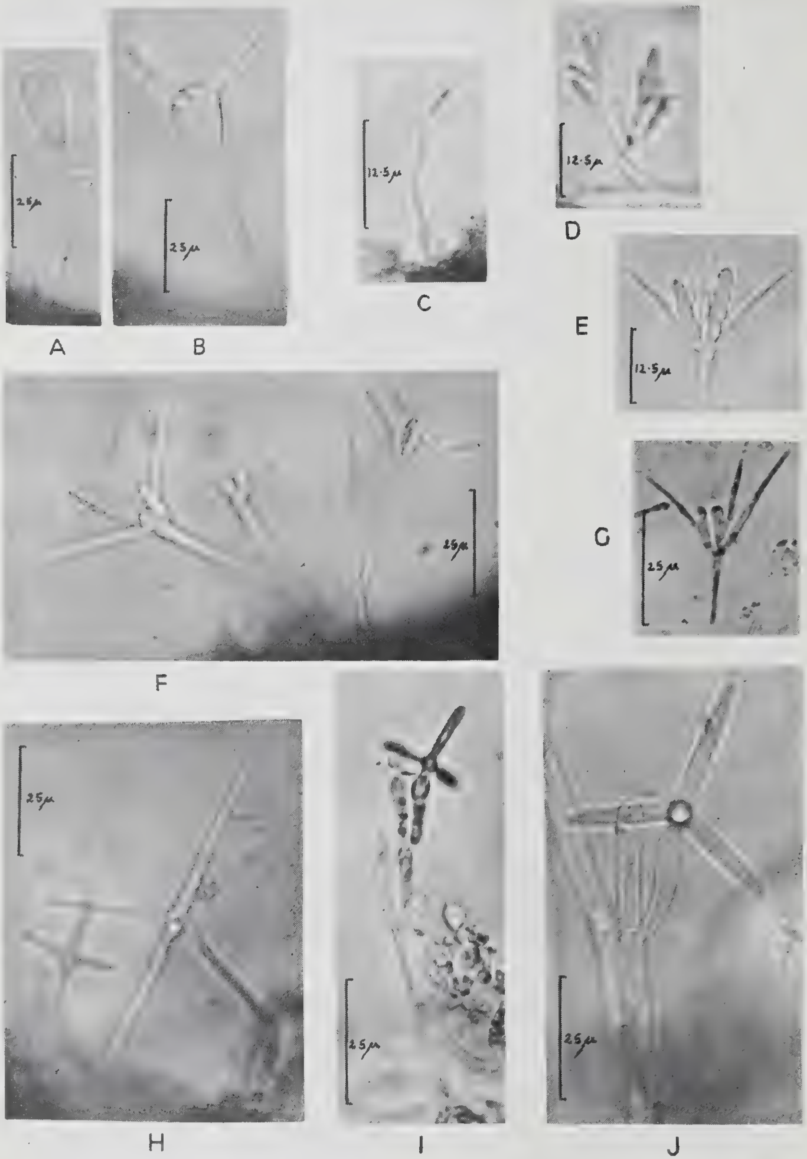

Plate XXVIII

Tetracladium marchialanum De Wild. (Plate XXVIII, F.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore sparingly branched often with two conidia at different stages of development. Conidium (aleuriospore) normally consisting of four divergent branches 20—40 μ long, 2—3 μ broad, and of two, more or less spherical knobs, 3—5 μ broad, one situated just above the point from which the four branches diverge, the other a short distance from this point on the upper side of one of these branches". (Ingold 1942).

Abnormal spores of the type described by Ingold (1942) from cultures of the fungus on malt agar have also been observed in water in which the fungus is growing on decaying leaves: one of these is illustrated in Plate XXVIII, G.

In addition to the above record of *Tetracladium marchialanum* from England it has been recorded from Switzerland (Ingold 1949), from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960) and Rhodesia (Ingold 1958). This fungus has been found growing on submerged leaf skeletons of *Populus nigra*, from the Belmont Valley and of *Salix babylonica* from Port Elizabeth, of *Combretum caffrum* from the Tyumie River and on soft but not slimy submerged leaf skeletons of *Plectranthus ecklonii* from the Hogsback. This fungus has been collected from April to August and was most abundant in July.

Spore development has been followed in hanging-drop cultures of the fungus growing on decaying leaves of *Populus nigra* (Fig. 7).

PLATE XXVIII.

A and B. *Clavariopsis aquatica* De Wild. Two conidiophores each bearing a conidium. "A" before lateral branches have formed. "B" almost mature. Growing on decaying leaf from the Hogsback. Mounted in water.

C. *Heliscus longibrachiatus* Ingold. Conidiophore with almost mature conidium. Growing on decaying leaf of *Quercus robur* from the Hogsback. Mounted in water.

D. *Tetracladium setigerum* (Grove) Ingold. Two branched conidiophores. Growing on decaying leaf of *Maytenus cymosus* from the Hogsback. Mounted in acid fuchsin and lactophenol.

E. *Tetracladium setigerum*. Liberated conidium. From Hogsback. Mounted in water.

F. *Tetracladium marchialanum* De Wild. Two conidiophores each bearing two conidia at various stages in development. The conidium on the extreme left is almost mature. Growing on leaf of *Combretum caffrum* from the Tyumie River. Mounted in water.

G. *Tetracladium marchialanum*. Abnormal conidium from Baakens River. Mounted in water.

H. *Triscelophorus monosporus* Ingold. Three conidiophores. The spore in the centre is almost mature. Growing on leaf of *Populus nigra* from the Belmont Valley. Mounted in water.

I. *Lemonniera aquatica* De Wild. Conidiophore growing on decaying leaf of *Populus serotina* from the Hogsback. Mounted in acid fuchsin and lactophenol.

J. *Lemonniera brachycladia* Ingold. Conidiophore with two phialides. Growing on decaying leaf of *Celtis africana* from the Hogsback. Mounted in water.

The spore primordium elongates and a small apical knob-like cell is cut off by a septum. A protuberance which will form the second divergent arm on the second knob of the spore appears just below this septum (Fig. 7, d). A second protuberance which will form the third divergent process appears on the opposite side of the knob (Fig. 7, g). On the side of the first protuberance there appears a third protuberance which will form the fourth divergent arm (Fig. 7, h, B). The mature spore is formed by further growth of its branches (Fig. 7, h-k, B) and is liberated by the apparent dissolution of the middle lamella of the wall separating it from the conidiophore (Fig. 7, 1). This pattern of development agrees with that described by Ingold (1942). The development of a spore from the formation of the primordium to the liberation of the spore takes about nine to ten hours.

Ingold (1942) noted that "while the developing spore is still young, usually when its first arm is beginning to grow out, the conidiophore gives rise to a branch a short distance below the first spore. This branch is soon cut off by a wall near its base and is the primordium of the new spore". Then after the first spore is liberated "while the second spore is still developing a new hypha grows out from the stump from which the first has separated. This usually arises slightly to one side of the stump. It is soon cut off by a cross-wall and is the primordium of the third spore". However, it was found that, though a branch may be produced a short distance below a developing spore, it may alternatively be produced slightly to one side of a developing spore, while it is still young. In the material examined it was more usual for a spore primordium to be produced next to a young spore than for it not to be developed until after the first spore was shed (Fig. 7a, gA).

The spores germinate readily on 2 per cent malt agar and in stream water. Pure cultures of this fungus have been obtained by spraying spores onto the surface of 2 per cent malt agar and by transplanting them after germination. The characteristics of the culture correspond to those described by Ingold (1942). The colony formed is compact, white to a pale pinkish yellow and zoned. There is a considerable zonal growth of white aerial mycelium. When strips of culture were transferred to sterile stream water, which was constantly aerated, spore primordia were produced abundantly within 18 hours and after 22 hours mature spores had developed.

Tetracladium setigerum (Grove) Ingold. (Plate XXVIII, D, E.)

"Aquatic fungus with branched septate mycelium. Conidium (aleuriospore) consisting of four divergent arms 20—40 μ long, each tapering from 3 μ near the central region of the spore to 1 μ near its tip, and of

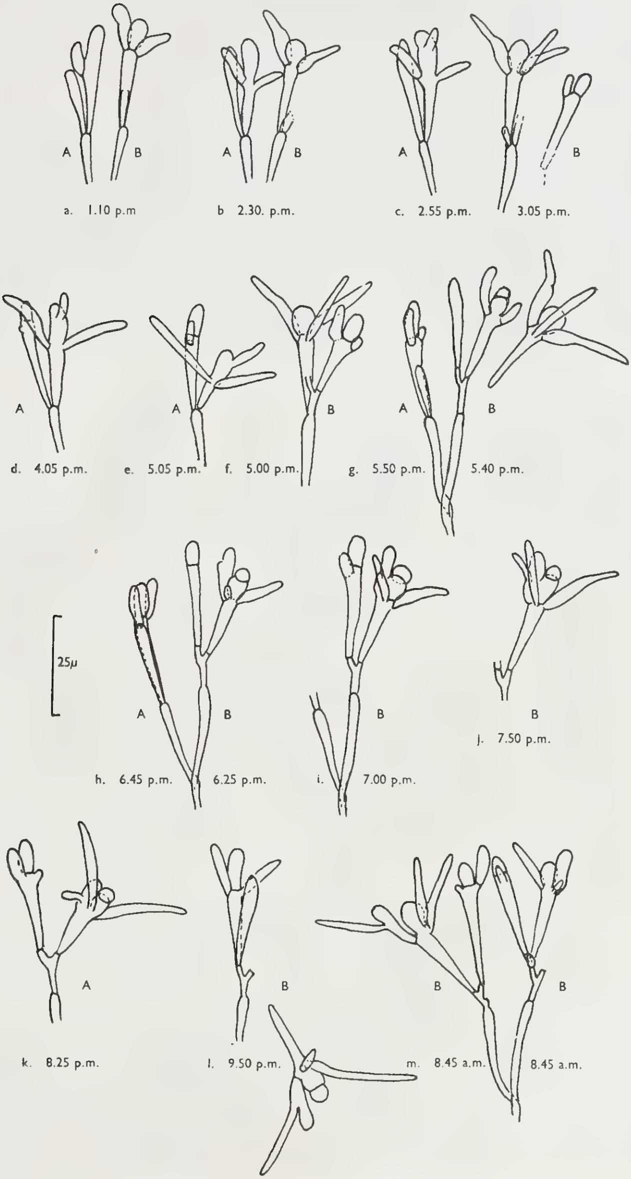

Fig. 7.—*Tetracladium marchialanum* de Wild. Spore development. From hanging-drop culture growing on a decaying leaf of *Populus nigra*.

three elongated, parallel, finger-like processes, 12—15 μ long, 3—9 μ broad, two of which are inserted just above the point of divergence of the four arms and the third a short distance along one of the arms". (Ingold 1942).

In addition to this record of *Tetracladium setigerum* from England it has been recorded from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960), Switzerland (Ingold 1949) and Rhodesia (1958) This fungus has been found growing on submerged leaf skeletons of the exotic tree *Populus serotina* and an indigenous tree *Maytenus cymosus* from the Hogsback. Spore development was followed in a hanging drop culture of the fungus growing on a decaying leaf of *M. cymosus* (Fig. 8) and confirmed the pattern of development deduced by Ingold (1942) from examination of conidia at various stages in their development.

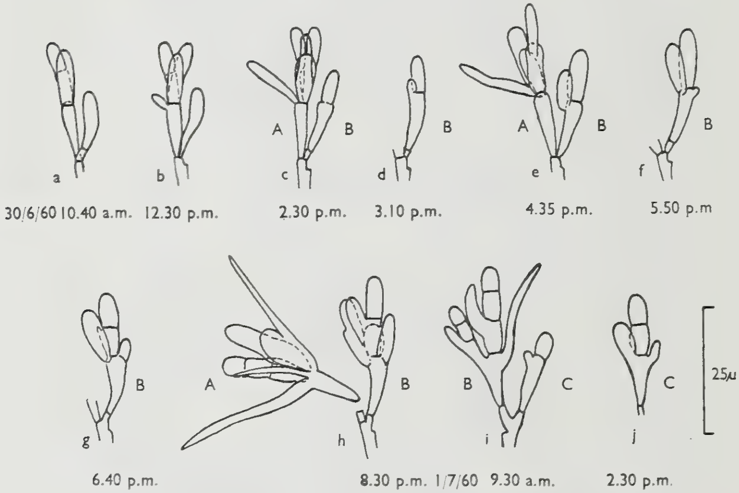

FIG. 8.—*Tetracladium setigerum* (Grove) Ingold. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Gymnosporia buxifolia*.

The first spore primordium is terminal on the conidiophore but, while this spore is still young, a short branch bearing a second primordium may be produced either beside the first spore or on a short branch which arises slightly below it. The primordium is cut off from the conidiophore by a septum and is in the form of a long slightly swollen cell (Fig. 8a). Towards the apex of this cell a septum forms, cutting off a small apical cell (Fig. 8, c) which will give rise to two of the finger-like processes and

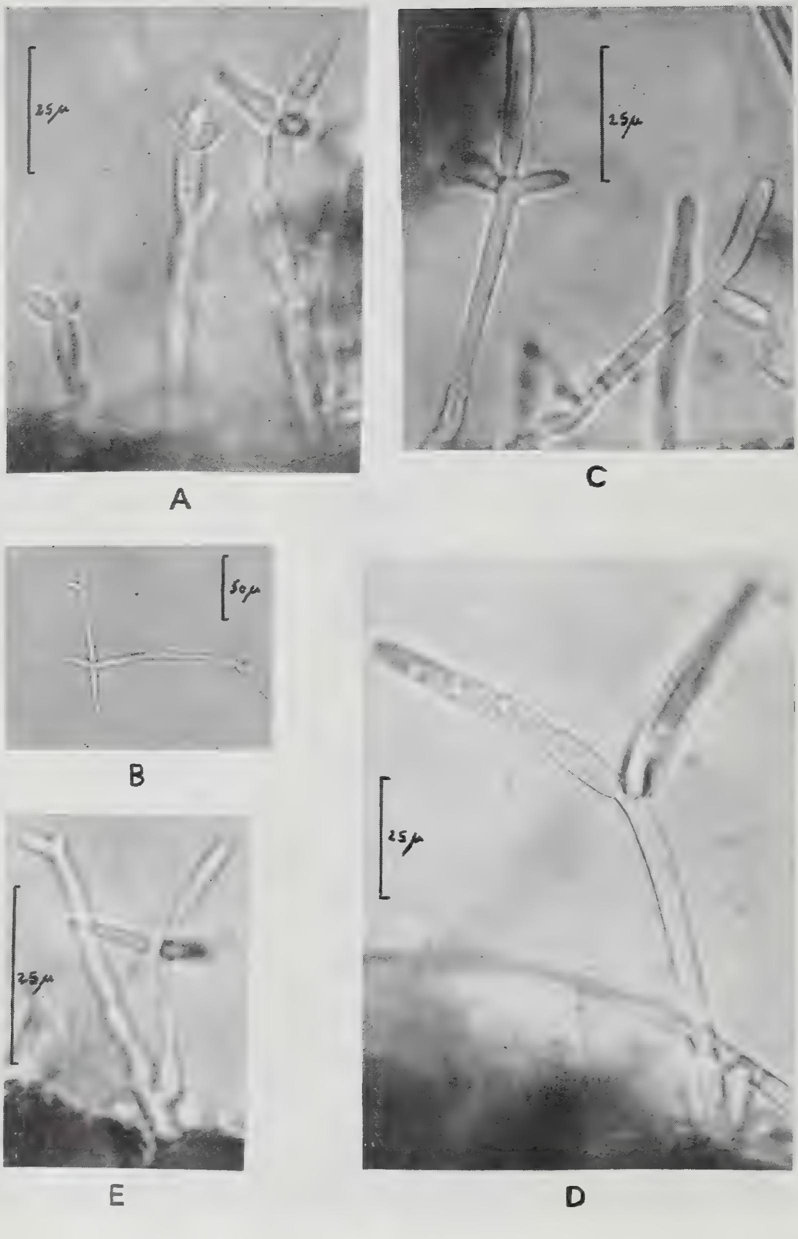

Plate XXIX

a large lower cell which is the first divergent arm. Soon afterwards a small protuberance, which will give rise to the third finger-like process and one of the divergent arms, appears slightly below and to one side of the septum (Fig. 8, d). As it grows, this process bends upwards, more or less parallel with the small apical cell which is also elongating. The apical cell becomes constricted about half-way along its length and a septum is formed at this level. Shortly afterwards, slightly below this septum, there appears a protuberance which becomes the second finger-like process (Fig. 8, g). While the first finger-like process is elongating, a protuberance which will form the third divergent arm appears slightly below the septum cutting off the first process and on the side away from the third process (Fig. 8, f). A protuberance which will form the fourth divergent arm appears at the same level as the third but between it and the third finger-like process (Fig. 8, h). Shortly after this, on the side of the third finger-like process about half-way along its length on the side away from the other two, there appears a protuberance which will form the second divergent arm (Fig. 8, h). A septum forms just above this protuberance across the third finger-like process which, like the other finger-like processes, may become further septate above the points of branching (Fig. 8, i). Liberation of the spore seems to take place, as in *Tetracladium marchialanum*, by solution of the middle lamella separating the spore from the conidiophore.

Articulospora tetracladia Ingold. (Plate XXIX, A.)

"Submerged aquatic fungus with branched, septate, hyaline mycelium. Conidium (aleuriospore) hyaline, of four divergent arms: the first formed arm 20—35 μ long, 3 μ broad, 1—2 septate, each with a narrow constriction or isthmus, where it joins the short arm. In the formation of the spore the four arms arise in succession. Conidiophore simple or

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PLATE XXIX

A. *Articulospora tetracladia* Ingold. Three conidiophores bearing conidia at various stages in development. Growing on decaying leaf of *Celtis africana* from Paradise Kloof. Mounted in water.
B. *Articulospora tetracladia.* Germinating conidium. Two germ tubes have developed into conidiophores on each of which a conidium has formed. From the Hogsback. Mounted in water.
C. *Articulospora grandis* n. sp. Conidia at various stages of development. Growing on decaying leaf of *Celtis africana* from Paradise Kloof. Mounted in water.
D. *Articulospora grandis* n. sp. Conidiophore with immature conidium. Growing on a decaying leaf of *Celtis africana* from Paradise Kloof. Mounted in water.
E. *Alatospora acuminata* Ingold. Branched conidiophore with two phialides each bearing a conidium. The conidium on the right is almost mature. Growing on a decaying leaf of *Maytenus cymosus* from the Hogsback. Mounted in water.

branched, producing spores from its apex (or apices) in succession, not basipetal but side by side. On decaying leaves of *Alnus glutinosa* from a stream in Leicestershire, England." (Ingold 1942.)

Other records of *Articulospora tetracladia* are from California (Ranzoni 1953), from Jamaica (Hudson and Ingold 1960), from Switzerland (Ingold 1949) and from Rhodesia (Ingold 1958). This fungus has been found from April to August growing on submerged leaf skeletons of *Populus serotina* from the Hogsback, of *Quercus robur* from the Hogsback and from Featherstone Kloof, *Celtis africana* from Paradise Kloof and from the Hogsback, *Rhus legati* from Howiesons Poort and from the Hogsback and *Maytenus cymosus* from the Hogsback.

Spore development was followed in hanging-drop cultures of the fungus growing on decaying leaves of *Celtis africana* (Fig. 9).

The spore primordium develops as an outgrowth from the tip of the conidiophore and is cut off from the conidiophore by a septum. It then elongates and becomes constricted a short distance below its apex (Fig. 9, i). The portion below the constriction is the first arm and the portion above the constriction will form the second arm. Soon afterwards on the side of the first arm just below the constriction there appears a protuberance which is constricted at its base and will form the third arm (Fig. 9, j). The fourth arm develops from a second protuberance which appears to one side of the third arm just below the constriction between the first and second arms (Fig. 7, l). When the spore is mature it is liberated by separation along the middle lamella of the septum between the spore and the conidiophore (Fig. 7, g, n). The development of a spore, under laboratory conditions, from the formation of the primordium to liberation of the spore, may take up to twenty-two hours. This confirms the account of spore development by Ingold (1942). Spores with only three arms are sometimes developed (Fig. 7, g). Before the spore has completed developing, at one side of it on the end of the conidiophore, a new spore primordium is developed or an outgrowth is produced which elongates and is divided by a septum into a spore primordium and a conidiophore cell.

The spores germinate readily in water and on 2 per cent malt agar. A germinating spore was found in which two of the germ tubes had developed into conidiophores bearing conidia (Plate XXIX, B). These conidia were much smaller than normally produced conidia.

The fungus has been isolated on 2 per cent malt agar by spraying spores on to a malt-agar plate and by subsequent sub-culturing on the same medium. The colony formed is compact, white with a fair amount of cottony aerial mycelium, zoning occurs near the edge of the colony. Conidiophores are produced after twenty-four to thirty-three hours and

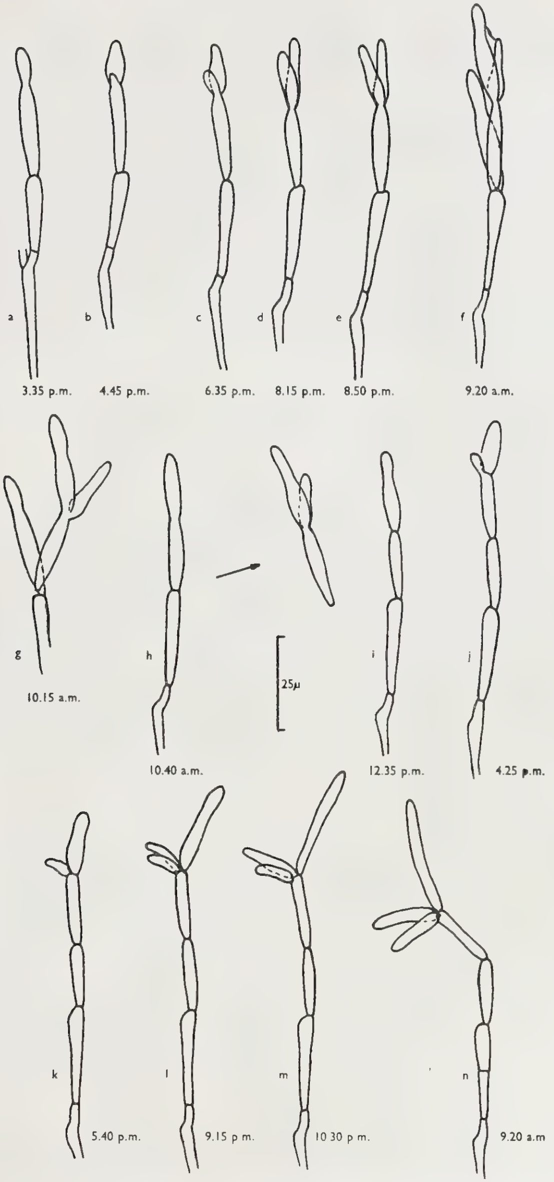

FIG. 9.—*Articulospora tetracladia* Ingold. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Celtis africana*.

the conidia produced agree with those formed in nature. This confirms the observations of Ingold (1942).

Articulospora inflata Ingold.

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore usually simple, 40—50 μ long, 3—4 μ broad, sometimes sparingly branched. Conidia (aleuriospores) hyaline, terminal, solitary, septate, quadraradiate: first formed arm continuous with the conidiophore 50—70 μ long, 3—4 μ wide, with the uppermost region (from which the other arms arise) slightly inflated: second formed arm not constricted at its base, 50—120 μ long, 3—4 μ broad; third and fourth arms 50—120 μ long, 3—4 μ broad, constricted at the base to 1·5—2 μ. On submerged decaying leaves of sycamore and oak from a stream near Leeds, England." (Ingold 1944.)

A fungus closely resembling this species has been found at Howiesons Poort on an unidentified decaying leaf from the Hogsback on a skeletonised leaf of *Populus serotina.*

Articulospora grandis n. sp. (Plate XXIX, C, D).

Submerged aquatic fungus with branched, septate, hyaline mycelium. Conidiophore hyaline, simple. Conidia (aleuriospores) produced in basipetal succession, hyaline, of four divergent arms: the first formed arm is 66—87 μ long, 6—9 μ broad at base, 0·4 μ broader at junction with the other arms; 3—7 septate; the other three arms 55—100 μ long, 9—11 μ broad at the base tapering to 5—7 μ broad at the distal ends; 3—7 septate: each constricted where it joins the first formed arm. In the formation of the spore the four arms arise in succession.

Hab. On submerged decaying leaves from streams in the Eastern Cape Province of South Africa.

Articulospora grandis sp. nov.

Fungus aquaticus, submersus, mycelio ramoso, septato, hyalino. Conidiophora hyalina, simplicia. Conidia (aleuriosporae) continua, ex eodem loco deinceps exorientia, hyalina, quadriradiata, quattuor radiis diversis. Radius primarius 66—87 μ longus, parte inferiore ad 6—9 μ latus, parte superiore ad 0·4 μ latior, 3—7 septatus. Radii ceteri 55—100μ longi, parte inferiore ad 9—11 μ lati, ad apicem ad 5—7 μ attenuati, 3—7 septati, unusquisque constrictus ubi radio primario conjungitur. In sporo formando quattuor illi radii continui deinceps evolvuntur.

Hab. In foliis putrescentibus, in fluminibus in orientale parte Capicae Provinciae Africae Australis submersis.

Articulospora grandis was found from June to August on submerged decaying leaves of *Celtis africana* from a stream in natural forest near Grahamstown and of *Rapanea melanophloeos* from Howiesons Poort.

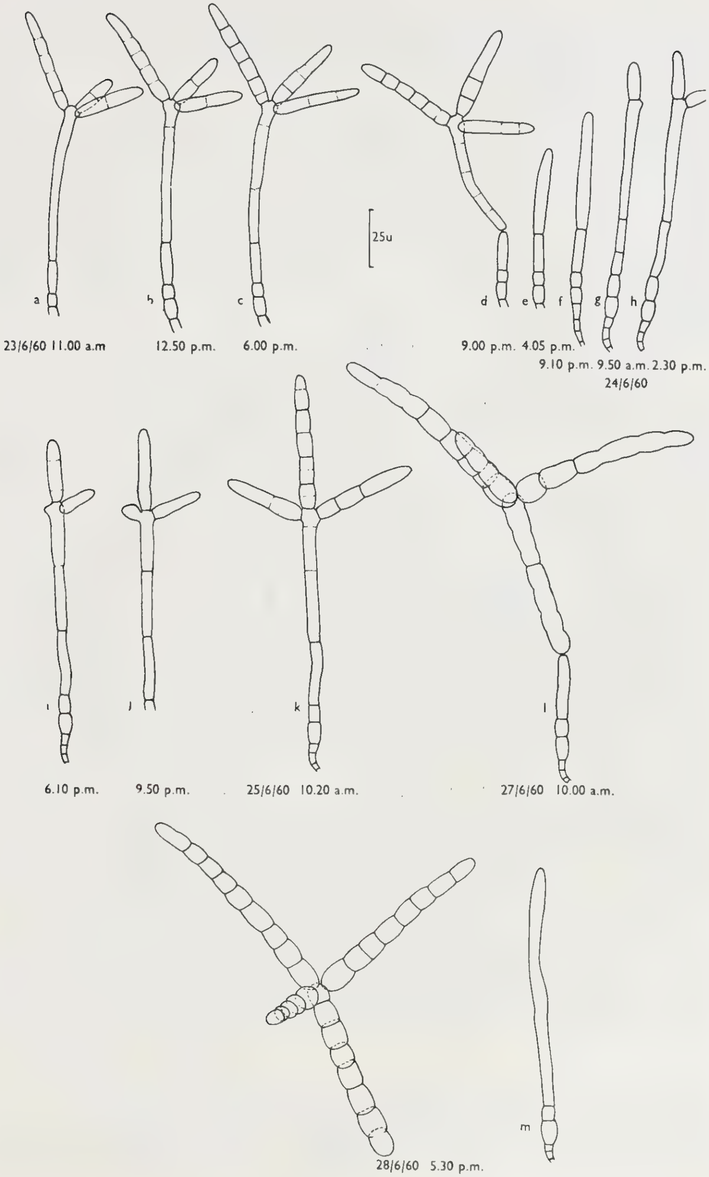

FIG. 10.—*Articulospora* sp. Spore development. From hanging-drop culture of the fungus on a decaying leaf of *Celtis africana*.

This fungus agrees with the general description of the genus *Articulospora* (Ingold 1942) but differs from the described species. The spores are larger than those of *Articulospora tetracladia* and are produced in basipetal succession in this fungus and side by side from the end of the conidiophore in *A. tetracladia*. Although the lengths of the arms of *A. grandis* correspond to those of *A. inflata* the arms are much broader than those of *A. inflata*, 9—11 μ broad at the base and 5—7 μ broad at the distal ends compared with 3—4 μ. Further, the second arm is constricted at the base in this fungus but not in *A. inflata*. The spores of this fungus differ from those of *A. moniliforma* Ranzoni in that they are much larger and the arms of the spore do not taper to a point at their distal ends as they do in the latter.

Spore development has been followed in hanging-drop cultures of the fungus growing on a decaying leaf of *Celtis africana* (Fig. 10).

The spore primordium is cut off from the conidiophore by a septum (Fig. 10, e). It is a long cell approximately the same width as the conidiophore. The primordium elongates and becomes constricted a short distance below the apex. A septum is formed in this region cutting off the primordium of the second arm (Fig. 10, g). A protuberance which will form the third arm appears just below and to one side of the septum. As the protuberance grows out, it becomes constricted at its base and a septum forms across this constriction (Fig. 10, h). A second protuberance which will form the fourth arm appears below and to one side of the second arm on the opposite side of the first arm (Fig. 10, j). This becomes constricted at the base and is cut off by a septum which forms across the isthmus (Fig. 10, k). The four arms of the spore are now delimited about 42 hours after the primordium was cut off from the conidiophore. The arms continue to increase in length and width, with the constriction at the base of the second, third and fourth arms becoming more marked. The arms become constricted at intervals along their length and septa start to form across these constrictions (Fig. 10, k, l). The spore is then liberated by the rounding off of the tip of the conidiophore and of the basal end of the first arm about 66 hours after the formation of the primordium. After the spore has been liberated, septum formation and increase in size continue (Fig. 10, m). The conidiophore elongates and another spore primordium is cut off but unlike *Tricladium splendens* no cells are added to the conidiophore. The spores germinate on 2 per cent malt agar.

Alatospora acuminata Ingold. (Plate XXIX, E.)

"Submerged aquatic fungus with branched, septate mycelium. Conidiophore usually unbranched consisting of a single phialide 10—20 μ long, 2—3 μ broad, but often branched producing a group of two to four phialides. Conidium (phialospore) unicellular, hyaline, consisting of four divergent and approximately equal arms, 15—35 μ long, 1·5—2·5 μ broad, tapering towards their apices. Conidia produced in basipetal succession from the phialide. On decaying leaves of *Alnus glutinosa* and *Salix sp.* from a stream in Leicestershire, England." (Ingold 1942.)

Other records of *Alatospora acuminata* are from Switzerland (Ingold 1949), California (Ranzoni 1953), Jamaica (Hudson and Ingold 1960) and Rhodesia (Ingold 1958). This fungus has been found growing on submerged decaying leaves of *Populus serotina, Quercus robur, Eucalyptus globulus, Grewia occidentalis, Maytenus cymosus, Calodendrum capensis, Podocarpus latifolius; Polystichum sp., Rubus sp.* and *Buddleja salvifolia* from the Hogsback; *Rhus legati* from Howiesons Poort; *Celtis africana* from Paradise Kloof; *Combretum africanum* from the Tyumie River and on a submerged decaying fruit of *Acacia sp.* from the Hogsback. Spores with five arms have been found to be produced though not frequently by the fungus growing on *Maytenus cymosus.*

Spore development has been followed in hanging-drop cultures of the fungus growing on a decaying leaf of *Maytenus cymosus* (Fig. 11).

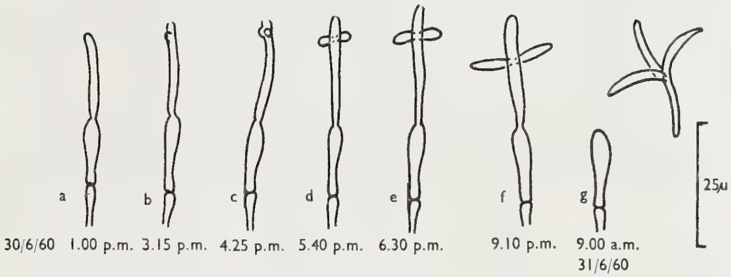

FIG. 11.—*Alatospora acuminata* Ingold. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Gymnosporia buxifolia.*

The spore primordium grows out from the apex of the phialide as a straight hypha which bends over near the tip. Two bulges appear simultaneously close together on the convex curve of the hypha. These two bulges elongate to form two arms of the spore. This confirms the observations of Ingold (1942). The spores germinate on 2 per cent malt agar.

Triscelophorus monosporus Ingold. (Plate XXVIII, H.)

"Submerged aquatic fungus with branched, septate, mycelium. Conidiophore hyaline, simple, straight, 15—45 μ long, 1·5 μ broad, producing a single terminal conidium. Conidia (aleuriospores) hyaline branched, aseptate (or with a single septum in the main axis just above the point of origin of the lateral branches): main axis continuous with the conidiophore, 50—70 μ long, 4—5 μ broad (at a distance of 3—5 μ from the base) tapering to 1·5 μ at the truncate base; secondary ramuli in a whorl of three, arising at a distance of 3—5 μ from the base of the main axis, 40—50 μ long, 2·0—2·5 μ broad near the base tapering to 1·5 μ at the apex, base abruptly constricted to 1μ. On a submerged decaying leaf from the river Loddon near Reading, England." (Ingold 1943.)

Other records of *Triscelophorus monosporus* are from California (Ranzoni 1953), Jamaica (Hudson and Ingold 1960), Rhodesia (Ingold 1958), Nigeria (Ingold 1956) and Ghana (Dixon 1959). This fungus has been found growing on submerged leaf skeletons of *Populus nigra* from the Belmont Valley, *Combretum caffrum* from the Tyumie River, on sub-

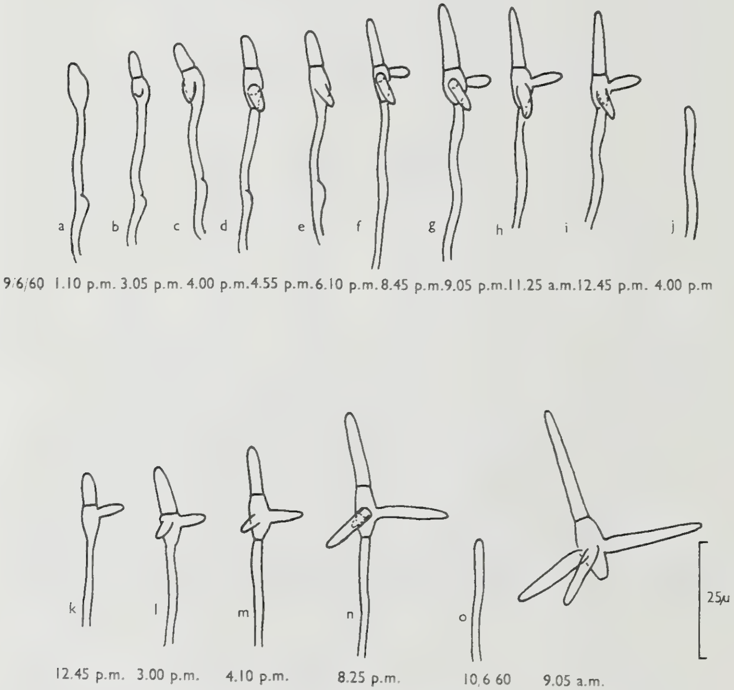

FIG. 12.—*Triscelophorus monosporus* Ingold. Spore development. From hanging-drop culture of fungus growing on a decaying leaf of *Rhus legati.*

merged decaying leaves of *Rhus legati* from Howiesons Poort and on a submerged decaying fruit of *Acacia sp.* from the Hogsback.

Spore development has been followed in a hanging-drop culture of the fungus growing on a decaying leaf of *Rhus legati* (Fig. 12).

The spore primordium starts as a swelling at the tip of a conidiophore. The swelling enlarges and becomes differentiated into a wide lower portion and a slightly narrower upper portion (Fig. 12, a). These two parts become separated by a septum. From the middle of the lower portion a protuberance appears and grows outwards to form one of the three lateral branches (Fig. 12, b). The upper part of the spore continues to elongate. A second protuberance which will form the second lateral branch arises at the same level but at an angle of about 120° from the first (Fig. 12, f). At about this stage in development the spore is cut off from the conidiophore by a septum. The third lateral branch arises as a protuberance at an angle of about 120° from both the other lateral branches. The spore increases in size and is liberated, when fully grown, by the separation of the middle lamella of the cross-wall between the spore and the conidiophore (Fig. 12, o). This confirms the account given by Ingold (1943), except that he found that the spore primordium was cut off from the conidiophore early in its development, whereas it would appear that the septum is not necessarily formed until after the second of the three laterals has been formed.

Lemonniera aquatica De Wild. (Plate XXVIII, I.)

"Submerged aquatic fungus with branched septate mycelium: conidiophore consisting of a straight unbranched portion which branches near its free end to form a group of two to eight phialides. Each phialide produces conidia (phialospores) in basipetal succession. Conidium consisting of four long divergent arms (which usually become septate), 20—70 μ long, 3—4 μ broad, and inserted on the phialide at the point of divergence of the four arms of the spore." (Ingold 1942.)

Records of *Lemonniera aquatica* are from England (Ingold 1942), Switzerland (Ingold 1949) and California (Ranzoni 1953). This fungus was found growing on submerged skeletonised leaves of *Populus nigra*, *Xymalos monospora* and *Maytenus cymosus* from the Hogsback.

Spore development has been followed in hanging-drop culture of the fungus growing on a decaying leaf of *Populus serotina* (Fig. 13).

The spore primordium starts as a small swelling at the end of the phialide (Fig. 13, d). This swelling enlarges (Fig. 13, a), becomes tetrahedral (Fig. 13, b, c) and the four arms grow out simultaneously from the corners of the tetrahedron (Fig. 13, d). When the spore is fully developed a line of cleavage forms separating it from the phialide and it is

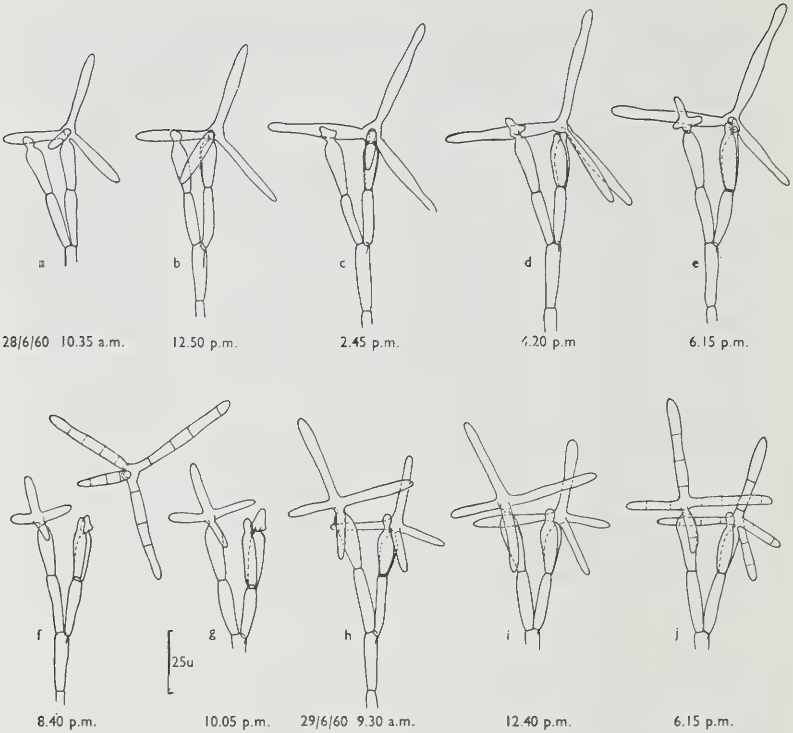

FIG. 13.—*Lemonniera aquatica* de Wild. Spore development. From hanging-drop culture of the fungus growing on a decaying leaf of *Populus nigra*, var. *italica*.

soon liberated. Just before (Fig. 13, j) or just after (Fig. 13, f) liberation the arms of the spore become septate. Immediately after a spore has been liberated a new spore primordium is formed from the tip of the phialide (Fig. 13, d). This account of spore development confirms that of Ingold (1942).

Lemonniera brachycladia Ingold. (Plate XXVIII, J.)

The following is a translation from the Latin description by Ingold (1958): Submerged aquatic fungus, mycelium branched, septate, hyaline at first, later brown. Conidiophore hyaline, septate, ending in one or many phialides. Conidium (phialospore) hyaline, consisting of four equal diverging branches arising from the first formed central portion. Each branch 15—50 μ long, 4—6 μ broad near the base narrowing to 3 μ at the apex, mostly aseptate, rarely uniseptate. Hab. on decaying leaves of *Alnus glutinosa*, etc., in running streams, Ide Hill, Kent, England.

Lemonniera brachycladia was found growing on submerged leaf skeletons of *Rhus legati*, *Calodendrum capensis* and *Buddleja salvifolia* from the Hogsback.

NOTES ON ECOLOGY

An investigation has been made of decaying plant material from streams, stagnant pools in dry river beds, ponds and dams. The aquatic hyphomycetes described in this paper were found in streams but not in any of the other habitats. The only stream site in which they were not found was the Blaaukrantz River, a mile or two below the outflow of the sewage effluent into the stream. A bacterial count was made at this site and it was found to be high. As conidial production in these fungi has been observed to be most abundant on leaf skeletons which are free from bacteria, it seems probable that the large bacterial population in this stream is responsible for these aquatic hyphomycetes being absent from an otherwise apparently suitable site. The fall in the production of conidia by the fungi on leaves kept in the laboratory, particularly when they were in unaerated water, was accompanied by an increase in bacteria. It would therefore appear that the reason for these fungi showing a preference for well aerated running water is in part due to the bacterial population being smaller than in poorly aerated stagnant water.

The pH of the water in most of the streams, where these fungi have been found, has been measured and is about 7·0. The water from the stream in Howiesons Poort had the lowest pH, 6·5, and that from the stream in the poplar plantation at the Hogsback had the highest pH, 8—8·5.

There does not seem to be a tendency for one of these fungi to become established on a leaf skeleton to the exclusion of the others. As many as seven species of these fungi—*Tricladium gracile*, *Clavariopsis aquatica*, *Anguillospora longissima*, *Tricladium splendens*, *Flagellospora curvula*, *Alatospora acuminata* and *Lunulospora curvula*—have been found growing on one square centimetre of a skeletonised leaf of *Rubus sp.* from the Hogsback. It is, however, more usual to find from one to three species on a leaf skeleton.

A wide range of decaying leaves are colonised by these aquatic hyphomycetes—a fern, *Polystichum sp.*; a Gymnosperm, *Podocarpus latifolius*; leaves of herbs, such as *Plectranthus ecklonii*, which form soft leaf skeletons; leaves of trees, such as *Celtis africana* and *Rhus legati* with relatively thin cuticles which disintegrate during skeletonisation; and of trees, such as *Eucalyptus globulus*, with thick cuticles which persist when the leaf is skeletonised. Some of these fungi have also been found on a decaying fruit of *Acacia sp.* in which the main veins were exposed.

The position in which the conidiophores are produced on the decaying leaf varies. The conidiophores may arise at right angles to the petioles, veins or leaf margins. Conidiophores occur with equal frequency on veins and leaf margins in *Tetracladium setigerum*, *Flagellospora curvula* and *Tricladium gracile*, on both veins and margins but more frequently on veins in *Lunulospora curvula*, most frequently on the margins of leaves which are not fully skeletonised in *Triscelophorus monosporus*, *Alatospora acuminata* and *Heliscus longibrachiatus* and more frequently on veins and petioles than on margins in *Clavariopsis aquatica*, *Lemonniera aquatica*, *L. brachycladia*, *Anguillospora longissima*, *Tricladium splendens*, *T. marchialanum*, *Articulospora tetracladia* and *A. grandis*.

As these fungi have as yet only been collected between April and August, no definite statements can be made as to seasonal fluctuations. However, the observations for *Lunulospora curvula* and *Alatospora acuminata* seem worth noting as they show a correspondence with Ingold's (1942) observations for these fungi in England. *Lunulospora curvula* was abundant in autumn, April and May, but showed a marked decrease in the winter months, July and August. Ingold (1942) noted that in England "this handsome fungus was found very abundantly on decaying submerged alder and willow leaves, especially during late summer and autumn. During winter and spring it was rather rare". *Alatospora acuminata* was not found in the autumn months, April, May and June, but was found in the winter months, July and August, and was particularly abundant in August. Ingold (1942) found that in England "it was especially common during the winter and spring, but much less frequent during the summer and autumn".

KEY TO THE SOUTH AFRICAN SPECIES OF AQUATIC HYPHOMYCETES

This key is merely intended as a guide to the identification of those aquatic hyphomycetes described in this paper, as it is probable that the key represents only a small number of the fungi of this type which occur in South Africa. *Campylospora* has also been included in the key, as one spore of a fungus in this genus was found in water from a stream at the Hogsback.

(1) Spores branched .. .. (6)
Spores unbranched .. .. (2)

(2)	Spores crescent-shaped	*Lunulospora curvula*
	Spores not crescent-shaped	(3)
(3)	Spores unicellular or bicellular: phialospores	(4)
	Spores multiseptate: aleuriospores	(5)
(4)	Spores less than 60 μ long	*Flagellospora penicilliodes*
	Spores greater than 100 μ long	*Flagellospora curvula*
(5)	Spores 5—6 μ broad in middle region tapering towards both ends: no projection at base	*Anguillospora longissima*
	Spores 3·8 μ broad tapering slightly at apex only: projection near base	*Anguillospora filiformis*
(6)	Spores consisting of a main axis with two branches arising at different levels	(7)
	Spores not as above	(8)
(7)	Main axis 6—7 μ broad at widest part	*Tricladium splendens*
	Main axis 3·0—3·5 μ broad at widest part	*Tricladium gracile*
(8)	Spore consisting of a clavate portion from which branches arise at the broad end	(9)
	Spore not as above	(10)
(9)	Clavate part of spore 30—40 μ long	*Clavariopsis aquatica*
	Clavate part of spore 10—20 μ long	*Heliscus longibrachiatus*
(10)	Spore asymmetric, consisting of a basal cell with two divergent appendages and a lateral branch with two divergent appendages	*Campylospora*
	Spores not as above	(11)
(11)	Spore with branches of more than one type	(12)
	Spore with branches all of one type	(13)
(12)	Spore consisting of four divergent arms and three finger-like processes	*Tetracladium setigerum*
	Spore of four divergent branches and two more or less spherical knobs	*Tetracladium marchialanum*
(13)	Spore with one of the arms bearing three other arms at its apex	(14)
	Spores not as above	(16)
(14)	Arm bearing the other three arms inflated at its apex	*Articulospora inflata*
	Arm bearing the other three arms not inflated at apex	(15)
(15)	Branches of spore 36—75 μ long, 3 μ broad, spores produced side by side at apex of conidiophore	*Articulospora tetracladia*
	Branches of spore 55—100 μ long, 4—11 μ broad at base: spores produced singly from apex of conidiophore	*Articulospora grandis*
(16)	Spore consisting of a curved axis bearing a pair of opposite arms	*Alatospora acuminata*
	Spores not as above	(17)
(17)	Spore consisting of a main axis somewhat swollen at the base bearing a whorl of three branches at the widest part	*Triscelophorus monosporus*
	Spore not as above	(18)
(18)	Arms of spore with parallel sides	*Lemonniera aquatica*
	Arms of spore with sides converging towards the free ends	*Lemonniera brachycladia*

ACKNOWLEDGMENTS

I wish to thank all those members of the Botany Department, Rhodes University, who assisted with the collection of material, especially Professor E. S. Twyman for his advice and encouragement; Professor C. T. Ingold for confirming that the two new species are, to his knowledge, as yet, undescribed; Mr. A. Milne for his assistance with the Latin diagnoses; and the Council for Scientific and Industrial Research for a bursary which I have received from them.

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Since submitting the paper for publication the attention of the author has been drawn to records of some of these Hyphomycetes from Sweden:

NILSSON, S., 1958. "On Some Swedish Freshwater Hyphomycetes". *Svensk. Bot. Tidskr.* 52, 291–318.

WILLEN, T., 1958. "Conidia of Aquatic Hyphomycetes amongst Plankton Algae." *Bot. Not.* 111, 431–435.

and from Japan:

TUBAKI, K., 1957. "Studies on the Japanese Hyphomycetes (III) Aquatic Group. *Bull. Nat. Sci. Mus. Tokyo.* 41, 249–268.

PROTEA PULCHRA, A NEW NAME FOR A PROTEA FROM THE SOUTH-WESTERN CAPE

By H. B. Rycroft

(*National Botanic Gardens of South Africa, Kirstenbosch*)

(With Plate XXX)

ABSTRACT

A species of Protea had long been known as *P. pulchella* Andr. This name is preoccupied by the name of an Australian species of Petrophila and therefore has to be discarded for the South African species. *P. subpulchella* Stapf. was once considered to be the same as *P. pulchella* Andr. but examination of the type specimen at Kew has indicated that it is different. The name *Protea pulchra* Rycroft is now given to the South African plant.

The name *Protea pulchella* was used by Schrad. et Wendl. in Sert. Hannov. vol. i, pt. ii, 15, t. vii (1796) to describe an Australian plant which is now known as *Petrophila pulchella* R. Br. The specific epithet therefore cannot be applied to the species of Protea named by Andrews in 1802 and which occurs in the south-western Cape.

In 1925 Stapf (Curtis Bot. Mag. t. 9057) published an account of *Protea subpulchella* based on a specimen grown in the Royal Botanic Gardens, Edinburgh. Dyer (1943) who was the first to realize that the name *P. pulchella* was invalid and considering that Stapf's species was specifically equal to *P. pulchella* Andr. decided that the name should be *P. subpulchella* Stapf to embrace both, although Stapf stated that "There are three rather indifferent figures of it (*P. pulchella*) in Andrews Botanical Repertorium (tt. 270,277 and 442). They show some range of variation in the colouring of the flower heads, but hardly any in their size, nor do the herbarium specimens which I have seen warrant the assumption that *P. subpulchella* is merely a reduced state of a plant whose heads measure 9—10 cm. by 5—7·5 cm. It has, in fact, by far the smallest heads of all the species of the *Speciosa* section, to which it undoubtedly belongs".

Stapf's type specimen was examined at Kew. It consists of a few leaves and a detached head which is very different from the commonly known *P. pulchella* Andr. and I agree that it cannot be regarded as the same species (see Plate XXX). It is possibly a "garden form" produced under conditions quite different from those obtaining in the natural habitat of *P. pulchella* Andr., or it might be a hybrid. Its exact origin is not known but Stapf wrote that "it was placed at our disposal by the courtesy of Professor W. Wright Smith of Edinburgh where it had been received in seed in September, 1919, from Mr. G. L. Smith, a member of the staff of the Cape Town Botanic Garden".

It was thought that a specimen of *P. subpulchella* Stapf might have been preserved in the herbarium of the Royal Botanic Gardens, Edinburgh, but investigation proved that no such material had been kept. The species is therefore represented only by the type specimen at Kew unless it is discovered some time in the future, which is unlikely.

Under the circumstances it has been decided that while *P. pulchella* Andr. cannot be upheld on account of preoccupation of the name for an Australian species and because *P. pulchella* Andr. and *P. subpulchella* Stapf are not specifically equal, a new name must be applied to the former. The name now given is *Protea pulchra* Rycroft.

This species was frequently misidentified in the past and was sent to many herbaria under incorrect names. Schlechter, MacOwan, Marloth and Dümmer for example distributed it as "*P. calocephala* Meisn" or "*P. calocephala* R. Br.", while Drege named some of his specimens "*P. lepidocarpon* R. Br." and "*P. mellifera* Th." On the other hand, the name *P. pulchella* was erroneously applied to illustrations of *P. neriifolia* R. Br. in Bot. Reg. t. 20 (1815) and in Reichenb. Fl. Exot. t. 218 (1835). The latter plate is a mirror image copy of the former.

The varieties *undulata* and *albiflora* of Phillips are not upheld. Like many species of Protea, *P. pulchra* is variable. Leaf margins may be flat, slightly undulate or decidedly undulate and the colour of the involucral bracts varies from red to pink, green, cream and white.

Most species of Protea are to be found in mountainous areas at high altitudes but *P. pulchra* usually grow on the lower slopes and flats. Previously it was recorded from the Cape Peninsula but it now seems to have been exterminated from that area.

SYNONYMY

PROTEA PULCHRA *Rycroft* nom. nov.

P. pulchella *Andr.* Bot. Rep. t. 270 (1802); non *Schrad. et Wendl.* Sert. Hannov. i, ii, 15, t. vii (1796); non *Sims* Bot. Mag. t. 796 but incl. ref. to R. Br. and Andr. (1805); non *Diet.* Bollst. Lex. Gart. Bot. 546 (1807); non Bot. Reg. t. 20 (1815); non *Reichenb.* Fl. Exot. iv, i, t. 218 (1835); *Poir.* Encl. Meth. Bot. v, 646 (1804); *R. Brown* in Trans. Linn. Soc. x, 81 (1810); *Ait.* Hort. Kew ed. II, i, 189 (1810); *Kerner* Hort. Sempervir. xxx, 352 (1813); *Steud.* Nomencl. Bot. 660 (1821); *Steud.* Nomencl. Bot. ed. II, i, 401 (1840); *Roem. et Schult.* Syst. Veg. iii, 348 (1818); *Endl.* Mant. Bot. Gen. Plant. Suppl. ii, 77 (1842); *Meisn.* in DC. Prodr. xiv,

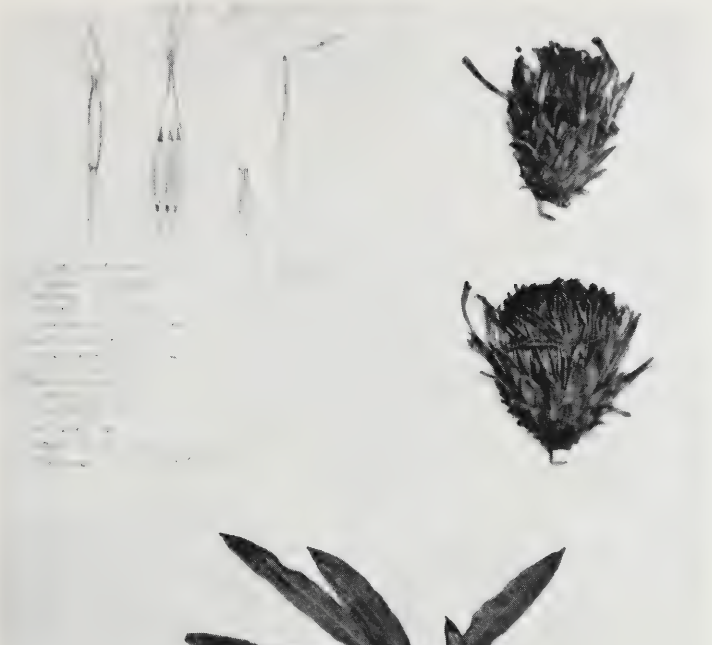

Plate XXX

Holotype of *Protea subpulchella* Stapf in the Herbarium of the Royal Botanic Gardens, Kew.

(*Photo: H. B. Rycroft*)

233 (1856), excl. ref. to Bot. Reg. and Reichenb.; *Sweet* Hort. Brit. 346 excl. ref. to Bot. Reg. t. 20 (1827); *Phill. et Stapf.* in Dyer Fl. Cap. v. i, 567 (1912).

P. pulchella var. **speciosa** *Andr.* Bot. Rep. t. 442 (1807); *Kerner* Hort. Semperv. xli, 482 (1818).

P. speciosa var. **rubra** *Pers.* Syn. Plant. i, 115 (1805).

P. speciosa var. **foliis glabris** *Andr.* Bot. Rep. t. 442 (1807).

P. speciosa var. **rosea** *Wendl.* Coll. Plant. iii, i, t. 73 (1819).

P. pulchella var. **undulata** *Phill.* in Dyer Fl. Cap. v, i, (1912).

P. pulchella var. **albiflora** *Phill.* in Ann. S. Afr. Mus. ix, iii, 93 (1913)

P. subpulchella *Dyer* in Fl. Plt. S. Afr. xxiii, t. 920 (1943); *Vogts* Prot. 57, t. 14 b (1958).

No specimen from which Andrews described the species appears to have been kept and the holotype therefore is the illustration in Andr. Bot. Rep. t. 270 (1802).

DISTRIBUTION

P. pulchra Rycroft.

TULBAGH: Saron, *Schlechter* 7869 "*P. calocephala* Meisn." (B, BOL, G, GRO, K, P, PRE, Z), Wolseley, *Hutchinson* (NBG).

CERES: Ceres, *Meebold* 12396 (M).

WORCESTER: Near Darling Bridge, *Salter* 7303 (BM).

WELLINGTON: Bainskloof, *Grant* 2493 (MO), *Anderson* (NBG).

PAARL: Frenchhoek, *Bolus in herb. Bol.* 8404 (BOL, PRE), *Steer* 945 (PRE), *Taylor* 1514 (NBG), Paarl, *Prior* (K, Z).

CAPE: Green Point, *Prior* (K, PRE), Lion's Head, *MacOwan* 2908 "*P. calocephala* R. Br." (K), *MacOwan Herb. Aust. Afr.* 1520 "*P. calocephala* Meisn." (G, K, UPS, Z), *Marloth* 3328 "*P. calocephala* Meisn." (K).

STELLENBOSCH: Helshoogte, *Kies Nat. Herb. PRE* 27143 (K, PRE), near Stellenbosch, *Niven* 56 (holotype of *P. pulchella* Andr. var. *undulata* Phill.) (K), Jonkershoek, *Rycroft* 1952 (NBG), Glen Connor, *Rycroft* 1279 (NBG), Stellenbosch, *Roxburgh* (BM), between Lowry's Pass and Jonkershoek, *Burchell* 8330 (K).

SOMERSET WEST: Helderberg, *Parker* 3674 (NBG).

WITHOUT LOCALITY: *Drege* (BM, CGE, G, G-DC, HAL, K, L, LD, MO, P), *Masson* (BM).

A NEW SPECIES OF HUERNIA FROM BAUCHI, NIGERIA

By J. J. Lavranos

(With Plate XXXI)

Huernia nigeriana Lavranos, nov. sp.

H. Volkartii valde affinis, sed caulibus valde crassioribus, brevioribus, lobis corollae ascendentibus, haud decurvis, lobis coronae exterioris subquadratis, lobis coronae interioris parte media flavis, apicem versus subulatis, decurvis et acuminatis discedit.

Caules erecti vel adscendentes, glabri, virides, ca. 7 cm. longi, 13–18 mm. crassi, 5-anguli, obtuse dentati; folia 2 mm. longa, acuta; flores solitarii; bracteae lineares, acutae, 5 mm. longae; pedicelli circa 10 mm. longi, 1·5 mm. crassi, teretes, glabri; sepala linearea, acuminata, 6 mm. longa, glabra, trinervia; corolla campanulata, 18 mm. longa, 22 mm. lata inter apices loborum, intus pallide lutea ubique maculis minutis, rubro-brunneis punctata, extus pallide punicea, rugosula, prominente nervata; lobi deltoidei, adscendentes, apicem paulo decurvi, 10 mm. longi, basi circa 7 mm. lati, intus papillis rubro-brunneis vel rarius albescentibus dense induti, extus prominente 5-nervii; lobi intermedii deltoidei, acuti, 1·5 mm. longi canaliculati, patentes; tubus 7 mm. longus, 9 mm. latus; tubi pars superior dense papillis 1 mm. longis induta, pars inferior glabra; corona exterior fusco-purpurea, 5 mm. diametro, basi tubi adpressa, lobis subquadratis, ad apices indentatis; coronae interioris lobi 4 mm. longi, erecti, basi fusco-purpurei, parte media flavi, conniventes, parte apicale fusco-purpurei, subulati valde decurvi et exserti 2·5 mm. supra antheras.

TYPE LOCALITY, 30 miles WSW of Bauchi, Nigeria, Dept. of Agriculture of Nigeria, col. Nov. 1960, Lavranos 1058, fl. Bryanston, Johannesburg, 19 April 1961 (PRE, Holotype).

Stems ascending-erect, rigid, appr. 7 cm. long, 13–18 mm. thick, glabrous, green, 5-angled, bluntly toothed.

Leaves 2 mm. long, acuminate, at right angles to the stem, persistent for two years.

Flowers solitary from the base of young stems.

Bracts linear, acute, 5 mm. long.

Pedicel terete, glabrous, cream-coloured, about 10 mm. long, 1·5 mm. thick.

Sepals linear-acuminate, 6 mm. long, glabrous, 3-nerved.

Corolla campanulate, 18 mm. long, 22 mm. broad between apices of lobes; *lobes* ascending, slightly decurved, deltoid tapering to an acute point, about 7 mm. broad at base, 10 mm. long; *intermediate lobes* deltoid, acute, canaliculate, spreading horizontally, 1·5 mm. long; *tube* 7 mm. long, 9 mm. in diameter; *outer surface* pinkish, fairly densely covered with minute wart-like dots, the lobes prominently 5-nerved, the nerves extending to the base of the tube; *inner surface* cream, densely marked with crimson dots, covered with cream and crimson papillae 1 mm. long at mouth of tube but shorter on lobes; base and lower part of tube glabrous.

Outer corona dark purple, adpressed against base of corolla-tube, about 5 mm. in diameter, the lobes subquadrate, as broad as they are long, with entire margins and one shallow indentation at their apices.

Inner corona lobes 4 mm. long, connivent-erect, dark purple and flattened at base, bright yellow with a prominent transverse ridge in the middle portion, thereafter dark-purple, subulate, the apices divergent-spreading, not enlarged and produced 2·5 mm. above the anthers.

In most characters *H. nigeriana* appears to be closely related to *H. Volkartii* Gossweiler from Southern Angola and Northern S.W. Africa. It differs, however, sufficiently from the latter species in having much thicker, erect stems up to 18 mm. in diameter, whereas the stems of *H. Volkartii* rarely reach a thickness of 10 mm.; in producing its flowers singly whereas in *H. Volkartii* flowers are usually born 2–5 from subsessile cymes and developed successively; the corolla-lobes are ascending and only slightly recurved, whereas in *H. Volkartii* they are strongly revolute; the outer corona-lobes are subquadrate, almost truncate and not narrowly lanceolate; the inner corona-lobes are bright yellow in the middle with a prominent transverse ridge, dark purple, subulate and strongly decurved in their apical part, and terminate in a rather sharp point. In all the numerous specimens of *H. Volkartii* which I have seen, whether from Angola or S.W. Africa, the inner corona-lobes were not at all divergent, dark purple throughout and distinctly enlarged at their apices.

H. nigeriana belongs to the *Hystrix* section of White and Sloane's *macrocarpa-brevirostris* group.

This, the most westerly known member of the genus was collected about 30 miles WSW of Bauchi in Nigeria in acacia scrub forest by an officer of the Nigerian Department of Agriculture. The climate of its habitat is characterised by a rather high summer rainfall of some 40 inches and an intensely dry winter season dominated by dessicating harmattan winds from the Sahara.

I am much indebted to Dr. R. A. Dyer, Chief, Division of Botany,

Pretoria, and his staff for the facilities of the National Herbarium, for the photographs accompanying this text and for much advice and guidance.

I also wish to thank the Nigerian Dept. of Agriculture for living plants of the species herein described as well as for plants of three species of Caralluma one of which, at least, would appear to be new to science. My thanks, finally, go to Mr. G. Papadakis, formerly of Lagos, Nigeria, to whose kind efforts, indirectly, I owe these plants.

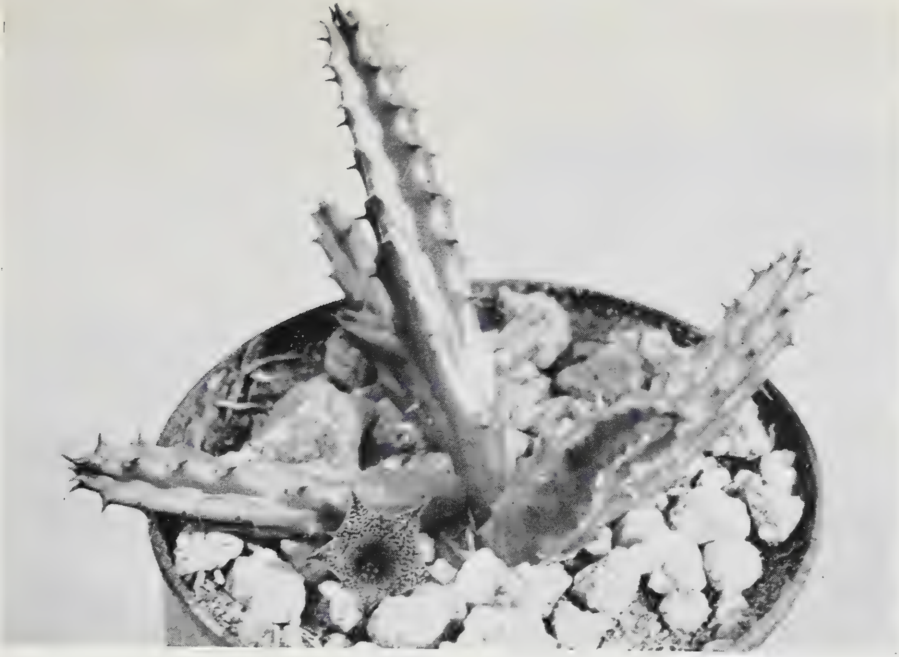

Fig. 1.

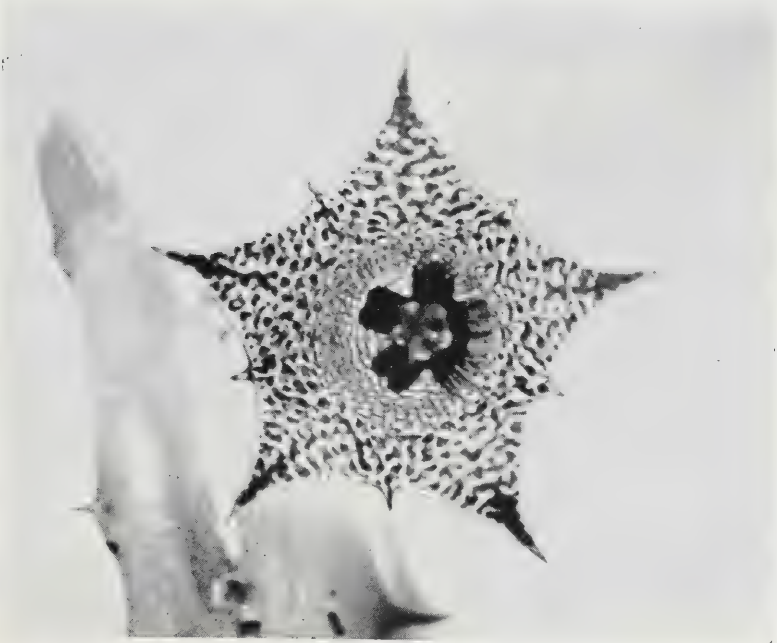

Fig. 2.

Plate XXXI. *Huernia nigeriana* Lavranos.

Fig. 1.—The type plant, actual size.
Fig. 2.—Flower × 3½.

(*Photos: Division of Botany, Pretoria.*)

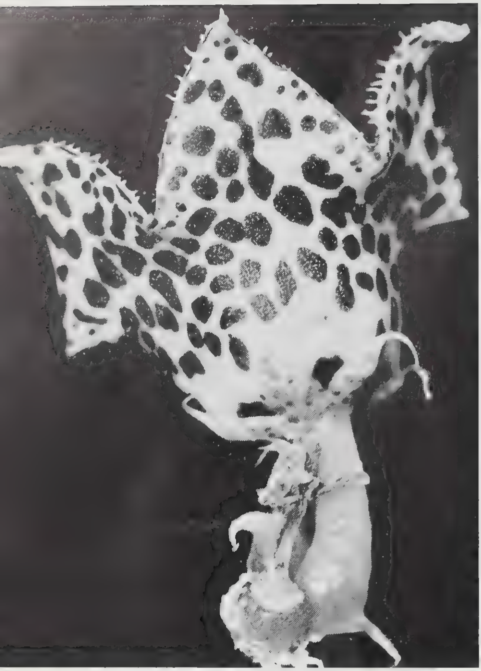

FIG. 1.

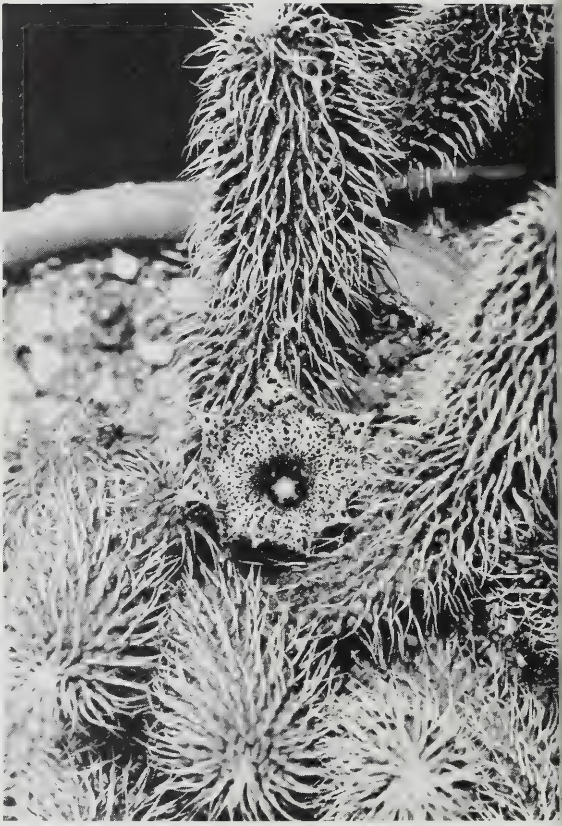

FIG. 2.

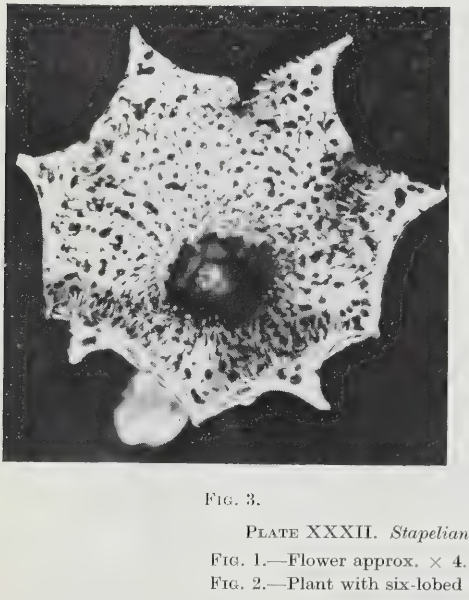

FIG. 3.

PLATE XXXII. *Stapelianthus pilosus* (Choux) Lavranos et Hardy.

FIG. 1.—Flower approx. × 4.

FIG. 2.—Plant with six-lobed flower approx. twice natural size.

FIG. 3.—A six-lobed flower approx. × 4.

(*Photos: Prof. Dr. W. Rauh.*)

A NEW NAME FOR A STAPELIAD FROM MADAGASCAR

By J. J. Lavranos and D. S. Hardy

(With Plate XXXII)

Stapelianthus pilosus (Choux) Lavranos et Hardy nom. nov. Species adhuc pro *Trichocaulon Decaryi* habita, lobis corollae intermediis, lobis coronae exterioris bifidis, erectis, floribus ex basi caulium productis, a *Stapelianthum* pertinet. Nomen, *Stapelianthus Decaryi* prioritatae temporis caret, ergo nomen novum sumendum est.

For some time, the authors of the present article had been puzzled by the classification and relationships of the species described by Professor P. Choux as *Trichocaulon Decaryi* Choux.

This species was discovered in 1931 by R. Decary on the slopes of Mount Angavo in the extreme South of Madagascar. It was from the material collected by Decary that Choux drew up his description which appeared in Annales du Musée Colonial de Marseille, No. 2.10, 1932. The peculiar stems of the species lead Choux to attribute it to the genus *Trichocaulon*.

However, careful consideration of the original description and accompanying photographs made us doubt the correctness of the classification of the species under *Trichocaulon*. In particular, the nature of the stems brings to one's mind not the robust, thorny stems of a member of the Section *Eutrichocaulon*, but rather those of *Huernia Pillansii*, N.E. Br., from which, in fact, they are almost indistinguishable. This alone, coupled with the fact that Choux's species produces its flowers from a peduncle and only from the very base of the stems would, in our view, constitute sufficient reason for a re-classification.

Apart, however, from these characters, the form of the corolla and, especially, of the outer corona with its erect bifid lobes suggested close relationship to *Stapelianthus* Choux, a genus very distinct and endemic to Madagascar.

We have grown and studied the flowers of all but one of the four known species of *Stapelianthus*. Of these, *S. Montagnaci* Bertr. et Boiteau and *S. insignis* Descoigns were not known at the time when Choux described the species under review. A comparison of flowers of these species and of the description by Choux of his Trichocaulon left little doubt in our minds that the re-classification of the species was called for. Efforts, however, to obtain living plants or specimens preserved in liquid remained fruitless.

In early 1960, Prof. Dr. W. Rauh of Heidelberg, Germany, visited Madagascar and succeeded in collecting specimens of Choux's plant in the area of the type locality. These were grown successfully at Heidelberg and at "Les Cèdres", the well-known botanical garden of M. Marnier-Lapostolle in Southern France. Professor Rauh was kind enough to send us live plants, specimens in liquid and the photographs accompanying this text.

It is now possible to examine this species closely. There is no doubt at all that its affinities are not to be sought in *Trichocaulon* but most definitely in *Stapelianthus*. While the stems, as stated, scarcely resemble those of any *Trichocaulon*, the entire floral structure is completely alien to that genus. The flowers of the species herein reviewed are strongly reminiscent of those of *Huernia* and it would belong to that genus were it not for the characteristic outer corona. The manner in which the flowers are borne is equally reminiscent of *Huernia* but entirely unknown in *Trichocaulon*.

The genus *Stapelianthus* Choux was principally based on the form of the outer corona which rises from the staminal column in an erect, five-lobed bowl. The lobes are more or less deeply bifid, adnate at their base to the inner corona-lobes and exceed the staminal column in height. As in the species under review the outer corona has all these characters typical of and peculiar to *Stapelianthus*, it is felt that it must now be transferred to that genus. Unfortunately, as the specific epithet has already been used in *Stapelianthus Decaryi* Choux, it has been necessary to give the species a new name. In view of the peculiar, hairy nature of the stems the above name has been considered appropriate.

The description given below is based on that by Choux, save that it has been amended on the basis of our own observations. It proved necessary to make certain modifications and additions of secondary importance to the original description of the species, particularly in respect of certain measurements, details of the form and colour of the corolla *et al.* In his description Choux states that the colour of the corolla is dark reddish, and he does not mention whether it is spotted. Whether this and certain other differences between his description and our own observations is due to variability of the species, or to the fact that Choux did not have live flowers at his disposal, could not be ascertained.

DESCRIPTION

Plant: succulent, freely branching from the base and forming dense groups.

Stems: erect, 9–12 cm. long (15–20 cm. when growing in deep shade) 8–12 mm. thick, vivid green during the rainy season, otherwise purplish-brown, densely tuberculate; tubercles conical, each tipped with a soft whitish hair about 2·5 mm. long.

Flowers: two or more from the very base of the stems, developed successively.

Pedicel: up to 7 mm. long, 1·5 mm. thick, minutely rugose.

Sepals: subulate, acute, glabrous, 5 mm. long, 1·6–2·00 mm. broad at base.

Corolla: campanulate, fleshy, *ca.* 14 mm. long and 14 mm. broad between apices of lobes, on both sides pale yellow marked with reddish-purple irregular dots, outside glabrous, inside covered throughout with short, cylindrical, pale yellow or reddish-purple papillae not more than $\frac{3}{4}$ mm. long; *tube* 8–8·5 mm. long; *lobes* deltoid, ascending, *ca.* 9 mm. broad at base, 6–7 mm. long, the apices slightly recurved; *intermediate lobes* very short, spreading horizontally.

Outer Corona: cupular, dark reddish-purple, approx. 3 mm. in diameter and 4 mm. high, exceeding the staminal column, the lobes free for about 2·7 mm., deeply bifid.

Inner Corona lobes short, deltoid, dark reddish-purple but with a somewhat lighter spot towards the apex, incumbent at their apices upon the anthers, adnate at their base to the outer corona.

Decary originally found plants of *Stapelianthus pilosus* on the bush clad slopes of Mt. Angavo, north of Ambovombé, in the extreme South of Madagascar. Professor Rauh collected the species in the vicinity of Ambovombé, at an altitude of approx. 300 metres. The plants grew in the shade of rather dense thorn-bush.

While in the characters of its stems *Stapelianthus pilosus* differs from all other known members of the genus, the flowers, in form, texture and colouring are very close indeed to *S. insignis* Descoigns and *S. madagascariensis* Choux.

We are much indebted to:

Prof. Dr. W. Rauh, Director of the Institute for Systematic Botany of the University of Heidelberg, Germany, for living plants, herbarium material, the excellent photographs accompanying this text and for much valuable information without which the present work would not have been possible.

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PRELIMINARY NOTES ON THE VEGETATION OF THABA 'NCHU

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ABSTRACT

The vegetation of Thaba 'Nchu (7,018 feet), a prominent mountain in the 30-inch rainfall area of the south-eastern Orange Free State, is described Special attention is paid to the influence of aspect and elevation on the vegetation. The soil is generally coarse, being derived from sandstone.

The most important perennial plants (105 spp.) are divided into nine communities, namely: Themeda Grassveld, Dry Mesophytic Bush, Xerocline Kloof Forest, Hyparrhenia Grassveld, Passerina-Cliffortia Association, Buddleja-Leucosidea Kloof Forest, Plateau Sourveld, Chasmophytic communities and Mesocline Tall Bush. The edaphic and microclimatic conditions prevailing in each community are discussed.

The relationships between the various communities are considered and special attention is paid to the presence and significance of the communities which represent the southern element of the flora of South Africa.

The role of fire in stabilizing the plateau grassveld is discussed in conjunction with the environmental factors which influence the distribution of the temperate Macchia community.

Based on the writer's observations in other parts of the country, the sociological position of the Buddleja-Leucosidea Kloof Forest, with regard to a Podocarpus forest, is postulated.

INTRODUCTION

The mountain known as Thaba 'Nchu rises 1,768 feet above the plains of the south-eastern Orange Free State grassveld, reaching a height of 7,018 feet above sea-level.

Situated in the 30-inch rainfall region and being in relatively close proximity to the mountains of Basutoland to the east and the plains which are rapidly being encroached upon by the karoo vegetation to the west, Thaba 'Nchu constitutes an unusual admixture of vegetation types whose inter-relationships are of special interest to the student of plant ecology.

GEOLOGY

The mountain falls within the area of South Africa underlain with parent rock of the Beaufort series of the Karoo system, which comprises a large area of the eastern part of the country.

The larger portion of the parent rock found on Thaba 'Nchu is sandstone of the Stormberg series, with the exception of the peaks dominating the summit, which are constituted of the Cave Sandstone so typical of the mountains of the eastern districts of the province.

SOILS

The soils derived from the sandstone parent rock are generally course and relatively infertile in comparison with the darker and richer soils derived from dolerite on hills and dykes in this district. Since soil conditions are the limiting factor in the case of certain edaphic climax communities, special mention is made of the soil conditions within the various communities described below.

CLIMATE

Striking vegetation changes indicate that in the absence of soil variations several meteorological factors are responsible for important differences in the microclimate experienced by situations occurring at various altitudes and on various aspects.

The part played by aspect in determining the floristic composition of the vegetation is especially striking along the upper edge of the eastern ridge, which comprises a steep-sided ridge running in an east-west direction on which vegetation types growing at the same altitude, on soil derived from a common rock, display marked differences in floristic composition, although they occur within 20 yards of each other in some places.

In general, edaphic and botanical features indicate a tendency toward a more moist microclimate with increase in elevation on similar slopes and aspects. At an elevation of over 7,000 feet, it is perhaps to be expected that not only would total rainfall be higher than on the surrounding plains (5,200 feet), but that the intensity and distribution of the precipitation, in conjunction with the more frequently occurring mist and cloud, would result in a considerably greater efficiency of the rainfall in promoting plant growth at such elevations.

Thus, although as mentioned earlier, present edaphic conditions, with moisture as the most important thereof, are closely correlated with the flora supported by various situations and may be regarded as being largely responsible for the various types of vegetation present, the interactions between temperature, evaporation and soil moisture resulting from differences in intensity of radiation, must be regarded as a basic cause of many of these variations in the vegetation.

VEGETATION

For the purposes of this outline of the flora, the vegetation of the mountain has been grouped into the following types:

1. *Themeda Grassveld,* occurring at the base of the mountain.
2. *Dry Mixed Bush,* occurring at low elevations on drier aspects.
3. *Xerocline Kloof Forest,* occurring in watercourses up to an altitude of approximately 6,000 feet.
4. *Hyparrhenia Grassveld,* occurring on the xerocline at higher elevations.
5. *Passerina-Cliffortia Association* in rocky, high altitude habitats, protected from fire.
6. *Buddleja-Leucosidea Kloof Forest* in protected situations at high altitude.
7. *Plateau Sour Grassveld.* A dense, high altitude grassveld community on level terrain.
8. *Chasmophytic Communities.*
9. *Mesocline Tall Bush,* which dominates certain moist aspects at higher elevations.

1. THEMEDA GRASSVELD

The plains surrounding the mountain are typical in floristic composition of large areas of the southern and south-eastern Orange Free State. The grassveld is of the mixed veld type with the following species the most abundant: *Themeda triandra, Cymbopogon plurinodis, Eragrostis chloramelas, E. lehmanniana, Elionurus argenteus, Digitaria argyrograpta* and *Heteropogon contortus.*

This *Themeda-Cymbopogonveld,* as Acocks* designates it, occurs on heavy loam or clay soils and frequently displays indications of retrogression, the subclimax stage of the succession frequently being dominated by *Eragrostis lehmanniana, E. superba, Aristida congesta* and *Sporobolus fimbriatus,* with *Aristida diffusa* variety *burkei* a common dominant on shallow hillside soils. The pioneer stage is represented by *Aristida curvata, A. barbicollis, Cynodon dactylon, C. hirsutus, Chloris virgata, Tragus koelerioides* and *Sporobolus ludwigii.*

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*Acocks, J.P. Veld Types of South Africa. Bot. Survey Mem. No. 28

2. DRY MIXED BUSH

This community occurs on the lowest slopes of the mountain, becoming gradually denser with decrease in elevation above the surrounding plains. Dry mixed bush occurs on well-drained soil derived from coarse sandstone and is well developed on the lower northern slopes of the mountain. In general, the trees do not exceed a height of 8 feet, the majority of woody shrubs being below 5 feet in height. The most important trees in this stony grassveld consist of *Rhus erosa*, *R. lancea*, *R. dentata*, *Diospyros austro-africana* variety *microphylla*, *Euclea obovata*, *E. crispa* and *Cussonia spicata*. Important associated shrubs and herbs in the dry mixed bush are *Maytenus cymosus*, *Artemesia afra*, *Asparagus denudatus*, *A. concinnus*, *Solanum incanum*, *S. panduraeforme*, *Walafrida saxatilis*, *Chrysocoma tenuifolia*, *Aster muricatus*, *A. filifolius*, *Gazania krebsiana* and *Lantana rugosa*.

The ground cover includes many representatives of the nearby *Themeda-Cymbopogonveld*, as well as several species of the *Gramineae* which are characteristic of stony hillside habitats or coarse gravelly soils commonly found on the xerocline of hills and stony ridges in the southern districts of the province. Among the characteristic hillside grasses may be listed *Brachiaria serrata*, *Heteropogon contortus*, *Rhynchelytrum setifolium*, *Aristida diffusa* variety *burkei*, *A. canescens*, *Cymbopogon excavatus*, *Enneapogon scoparius* and *Hyparrhenia hirta*. Other common grass species, although not characteristic of hillside situations, include *Themeda triandra*, *Cymbopogon dieterlenii*, *C. plurinodis*, *Eragrostis chloromelas*, *E. lehmanniana*, *E. superba*, *E. curvula*, *Elionurus argenteus*, *Setaria flabellata*, *Sporobolus fimbriatus* and *Digitaria eriantha*.

In localized areas where animals tend to concentrate *Cynodon hirsutus* and *Sporobolus fimbriatus* are common, with *Aristida curvata* and *A. barbicollis* abundant on denuded areas.

This portion of the mountain has clearly been subjected to a heavier grazing intensity than is the case in more elevated areas and, partly as a result of such treatment, a sparse cover and the erosion associated with such a condition on sloping soil is of common occurrence.

3. XEROCLINE KLOOF FOREST

The major watercourses which drain the northern slopes support a characteristic mixed bush which has a closed canopy. The community consists largely of woody trees and shrubs which are typical of the tropical element of the flora of Thaba 'Nchu. As a result of the steep slope of such watercourses, the resultant erosion has resulted in a rocky habitat immediately adjacent to the drainage area of the ravines.

The most abundant trees occurring in the xerocline kloof forest are *Rhus lancea, Olea verrucosa, Euclea crispa, Cussonia paniculata, Grewia occidentalis, Rhus pyroides* variety *typica*, with *Heteromorpha trifoliata, Clutia pulchella, Osyris compressa, Xylotheca kraussiana* variety *glabriflora* and *Rhamnus prinoides* becoming more important at higher altitudes, i.e. above 6,000 feet.

As a result of the dense shade cast by the kloof forest a poorly developed ground cover occurs, while the climber *Rhoicissus cuneifolius* is commonly found in a variety of trees.

4. HYPARRHENIA GRASSVELD

The drier habitats of the northern slopes situated at an elevation of above 6,000 feet are characterized by the dominance of *Hyparrhenia hirta*, with trees and large shrubs limited almost entirely to the upper reaches of the watercourses and to the immediate vicinity of large sandstone boulders. It would appear that the protection from fire, afforded by such rocky habitats, is responsible for large trees and woody shrubs being limited almost entirely to such situations on this portion of the mountain.

The conditions favouring the occurrence of fierce grass fires are much more prevalent in the higher-lying *Hyparrhenia* veld for several reasons. Firstly, the tall growth form of the *Hyparrhenia* is conducive to a more damaging fire than would be expected from the shorter growing grassveld at lower elevations. Secondly, the more remote and steeper high-lying slopes, on which *Hyparrhenia* is dominant, are less prone to intensive grazing pressure than is the case on the lower slopes which are more easily accessible to grazing animals and consequently show marked indications of over-grazing.

Associated with *Hyparrhenia* in this grassveld community are several grasses which are characteristic of mountain slopes in this part of the province, namely: *Brachiaria serrata, Rhynchelytrum setifolium, Aristida diffusa* variety *burkei, A. canescens, Setaria flabellata, Cymbopogon dieterlenii*, with *Hyparrhenia glauca* and *Pennisetum sphacelatum* locally dominant in moist habitats receiving full sunlight.

5. PASSERINA-CLIFFORTIA ASSOCIATION

Adjacent to the summit plateau lie large slabs of rain-washed and weathered sandstone between which pockets of soil have accumulated. The shallow soils in these pockets support an interesting temperate flora, dominated by shrubs which are collectively termed Macchia or "Fynbos". These representatives of the temperate flora of the western Cape form a community which is strikingly different from the other types of vegetation found in this part of the country. Their relationship to the local karroid element of the vegetation is of particular interest, especially when typical karoo pioneers such as *Chrysocoma tenuifolia* are found growing in this community to a height of 3 feet and having a canopy diameter of 3—4 feet. This relationship is discussed later, in conjunction with large-scale migrations of vegetation.

The most abundant sclerophyllous species are *Passerina montana, Erica maesta, Cliffortia nitidula, Stoebe vulgaris* and *Anthospermum tricostatum.* These evergreen dark green or silver shrubs are only found above an altitude of about 6,500 feet, *Stoebe vulgaris* being found at somewhat lower elevations than the others in this community. In certain high altitude situations on steep northern slopes these sclerophyllous species grow in a mixed community with certain grasses commonly found in high altitude mountainous areas, namely *Koelaria cristata, Eragrostis racemosa* (= *E. chalcantha*), *E. capensis* (= *E. brizoides*) and *Pentaschistis setifolium.*

The genus *Pentaschistis* is especially noteworthy in this part of the country, since, like *Ehrharta,* it is a temperate genus, abundant in the south-western Cape and only found in the south-eastern portion of South Africa along migration routes, such as the Stormberg and Drakensberg mountain ranges where sufficient winter moisture and relatively cool summer temperatures result in environmental conditions suitable for its existence.

6. BUDDLEJA-LEUCOSIDEA KLOOF FOREST

The *Buddleja-Leucosidea* kloof forest consists of a closed forest 8—15 feet high occurring in sheltered ravines at altitudes above 6,500 feet, in which sufficient soil is available to support a dense forest growth.

Although *Buddleja salvifolia* and *Leucosidea sericea* may be regarded as the trees which are most typical of this community, several other tall-growing woody species are associated with these species. Such forest species include *Printzia pyrifolia, Clutia pulchella, Euclea crispa, Osyris compressa, Xylotheca kraussiana* var. *glabrifolia, Heteromorpha arborescens, H. trifoliata, Myrsine africana* and *Rhamnus prinoides.*

The lianes *Rhoicissus cuneifolius* and *Cissus anatomicus* are also common in this forest community, which, due to the dense shade cast by the canopies of the trees, includes but a poorly developed ground layer in many parts.

Buddleja salvifolia and *Leucosidea sericea* also occur in localized moist sites on the xerocline at altitudes above 6,000 feet where reduction in slope results in accumulation of runoff water from the rocky slopes.

When it is borne in mind that *Buddleja salvifolia* and *Leucosidea sericea* are commonly regarded as forest-margin species to *Podocarpus* climax forest in several parts of South Africa, their appearance on Thaba 'Nchu, especially associated as they are with *Rubus ludwigii*, *Leonotus leonurus* and *Helichrysum nudifolium*, is of special significance in postulating the climatic climax of the situations concerned. This aspect is considered later in the discussion of relationships between the vegetation types occurring on the mountain.

7. PLATEAU SOUR GRASSVELD

Between the rocky outcrops and peaks of Cave Sandstone which form buttresses around the edge of the summit, lies a plateau of level or gently undulating ground with a relatively deep fertile soil which is dark in colour and has a high organic matter content as compared with the soils of other situations on the mountain.

The plateau is virtually devoid of trees and woody shrubs, the open rolling grassveld affording good summer grazing.

The dominant grasses are typical of the sour veld communities of the high-lying mountainous areas of the eastern districts of South Africa, many of the most important species being confined almost entirely to such areas.

Mixed dominance occurs generally over most of the plateau area, the most abundant species being *Andropogon appendiculatus*, *Helictotrichon turgidulum*, *Microchloa caffra*, *Pennisetum sphacelatum*, *Fingerhuthia sesleriaeformis*, *Eragrostis capensis* (= *E. brizoides*), *E. racemosa* (= *E. chalcantha*), *E. caesia*, *E. plana*, *E. planiculmis*, *E. chloramelas*, *Harpechloa falx*, *Cymbopogon dieterlenii*, *Koelaria cristata*, *Digitaria monodactyla*, *Themeda triandra*, *Elionurus argenteus* and *Sporobolus fimbriatus*.

In moist shady habitats, several moisture-loving grasses are abundant, namely, *Bromus speciosus*, *B. catharticus*, *Stipa dregeana* var. *elongata*, *Festuca longipes* and *Agrostis bergiana*.

The physiognomy and floristic composition of the plateau sour veld indicate that regular burning is an important environmental factor responsible for the dense short grassveld sward prevailing. The absence of rocks and the protection which they afford from fire, probably accounts for the almost complete lack of woody plants representing stages in the succession above the grassveld stage.

The level terrain, together with the more moist high altitude microclimate and the lower temperatures associated with such conditions, would undoubtedly result in lower runoff, a more moist soil and lower evaporation as a result of the lower temperatures in this region. In the absence of regular fire, a rapid progressive succession may well result first in a tall *Hyparrhenia glauca-veld,* followed by the forest margin shrubs *Leucasidea sericea* and *Buddleja salvifolia,* or alternatively in a dense growth of macchia of mixed dominance, with *Passerina montana, Erica maesta, Cliffortia nitidula* and *Anthospermum tricostatum* dominating the lower-growing members of this community such as *Stoebe vulgaris* and *Helichrysum dregeanum.* The writer has observed that overgrazed *Themeda-Tristachya* grassveld on the Amatola mountains reverts to a sere dominated by *Helichrysum,* which, when protected from fire and grazing for many years, progressed via the grassveld sere to a sere dominated by *Cliffortia* and other macchia types. Similarly, cessation of burning has resulted in the development of thickets of *Elytropappus rhinocerotis* in coastal areas near Grahamstown.

8. Chasmophytic Communities

The temperate macchia type of vegetation mentioned earlier is supported mainly by the pockets of soil between the large slabs of sandstone at high altitudes. In situations which present less favourable edaphic conditions in these rocky situations, several chasmophytic genera are found to represent a local edaphic climax, namely, *Ruschia putterilii, Eriocephalus eximius* and *Pentzia tortuosa.* This low bush community appears to be a reaction not only to poor edaphic conditions but also to continuous wind exposure, especially on the bare convex formations on the highest rocky peaks.

These bushes usually occur in isolated colonies and display an open structure owing to the absence of soil. As soil accumulates, so a more varied and complex community is built up from representatives of the surrounding bush communities. The grasses most commonly included in this chasmophytic community are *Eragrostis caesia* and *E. planiculmis.*

9. Mesocline Tall Bush

On the more elevated sites of the mesocline of the eastern ridge a bush community, varying in density from relatively open to an impenetrable thicket in the more sheltered habitats, occurs. The greater portion of the mesocline is south-west facing, and as a result of aspect and slope receives the sun's rays at such an oblique angle that during winter, even in the areas which support open bush, the soil receives virtually no direct sunlight. The cooler and more moist conditions prevailing on such situations are responsible for a formation and floristic composition which is completely different from the xerocline community at the same altitude. The direction of rainfall may also be a factor responsible for this contrast. In general, these mesocline slopes are not as stony as the xerocline closeby, while the evenly distributed nature of the bush gives the impression of at least a certain degree of protection from fire, as opposed to the xerocline bush which is restricted to damp ravines or the immediate vicinity of large boulders. The mesocline bush is of mixed dominance with *Rhus dentata, R. divaricata, Euclea crispa, Rhus dregeana, Leucosidea sericea* and *Rhamnus prinoides* the most abundant shrubs. In the second layer of the vegetation of the mesocline tall bush, the following species are common: *Selago galpinii, Sutera pristisepala, Helichrysum nudifolium, Pentzia cooperi, Leonotus leonurus, Lotononis trisegmentata, Lasiosiphon capitatus, Senecio isatideus, Indigofera zeyheri, I. stenophylla, I. hedyantha, Hebenstretia cooperi, Eriocephalus eximius, Aster petiolatus, Sutherlandia frutescens* and *Osteospermum scariosum.*

RELATIONSHIPS OF THE VEGETATION

The sociological status of the various communities representing the tropical element of the flora of Thaba 'Nchu in relation to each other is relatively simply explained, moisture conditions in localized situations being the most important factor determining the degree to which progressive succession will develop in each habitat.

While the important effects of edaphic conditions and protection from fire on the structure of the temperate macchia are often striking, the relationship between this temperate element of the mountain's flora and the tropically derived element is somewhat obscure. This is particularly so when the environmental conditions suitable for the tropical savannah flora, the karroid vegetation and the temperate sclerophyllous bush respectively are considered. As mentioned earlier, the writer has observed that cessation of veld burning in several parts of the country leads to a more luxuriant growth of the macchia community and often a spreading thereof. Generally, the migration of this form of temperate flora has taken place along mountain ranges which offer climatic conditions more suitable for its spread than is afforded by vast plains.

The increase of such sclerophyllous species as *Stoebe vulgaris* in the northern Orange Free State and of *Athanasia acerosa* in the vicinity of Curry's Post in Natal are considered as being part of the macchia movement in South Africa, but whether the macchia occurring on Thaba 'Nchu is the relic of an earlier more northernly temperate flora than is the case to-day, or whether it constitutes a more modern northward and eastward migration of the "Cape Flora" is difficult to establish.

There is a gradual yet complete transition between the more xerophytic bush communities of the drier slopes and the sclerophyllous communities at higher altitudes; however, interesting examples of mixed hillside grassveld consisting of species typical of low hills in the central portion of the province are found as high as 6,500 feet above sea-level on Thaba 'Nchu. At such high elevations the close affinity between the tall sclerophyllous bush or macchia and the karroid vegetation is clearly displayed. Where such species as *Walafrida saxatilis, Aster filifolius, A. muricatus, Chrysocoma tenuifolia, Pentzia cooperi* and *Helichrysum dregeanum* are found growing side by side with the tall genera such as *Passerina, Cliffortia, Erica* and *Anthospermum*, it is not difficult for the student of plant ecology to accept that the karroid vegetation is an adaptation of the temperate macchia to the arid conditions of the karoo areas.

When the denser and often taller growth of grass and herbs on steeper higher-lying slopes is compared with the basal cover and height of the grass sward found on the lower more gentle slopes, the significance of overgrazing and selective grazing as causal agencies of these differences should not be underestimated in favour of microclimatic considerations. The general effect of regular grazing is to produce a less dense vegetation with a structure which indicates more xerophytic conditions than actually exist. In addition, the moister soil resulting from the proportionately larger surface area covered by rock, causing important runoff differences at high elevations, is of great importance in comparing the grassveld communities of the upper and lower slopes.

On first confronting the *Buddleja-Leucosidea* Kloof Forest, the designation of the sociological status of this community in relation to a possible *Podocarpus* climax forest immediately presents an issue worthy of further consideration. The writer has observed these two tree species acting as forest-margin plants seral to a climax *Podocarpus* forest on the Hogsback mountains of the eastern Cape, on Rensburgskop in the eastern Orange Free State, in several localities of the Drakensberg in the Estcourt district and in the Weza forest near Kokstad. The absence of *Podocarpus* species from the sheltered ravines on the high elevation mesocline of Thaba 'Nchu is difficult to explain in terms of edaphic limitations, when the abundance of *Buddleja* and *Leucosidea* together with the edaphic conditions prevailing in the marginal zones of *Podocarpus* forests in other parts of the country are considered. In the light of Clement's theory based on the monoclimax concept, continued reaction of the present dominants would be expected to lead eventually to the appearance of *Podocarpus* in this kloof vegetation. An explanation would thus have to be sought for the absence of *Podocarpus* from this seemingly permanent and stable *Buddleja* and *Leucosidea* forest supported by a soil which is apparently suitable for the *Podocarpus* climax. Alternatively the present community may be considered as the ultimate stage in progressive succession, as originally explained by Tansley as follows: "If the change is too slow to appreciate or too small to affect the general nature of the vegetation, the apparently stable phase must still be called a climax".

Three factors may be limiting either individually or collectively in the occurrence of *Podocarpus* on Thaba 'Nchu, namely, too long an annual period of frosty weather, too low a rainfall and the absence of the symbiotic bacteria associated with root nodule formation in *Podocarpus falcatus* and *P. latifolius*. It is further possible that the frequency of fires in such situations has been higher than is necessary for the succession to pass through all the seral stages preceding the *Podocarpus* climax.

A NEW SPECIES OF URSINIA

By H. M. L. Bolus and H. Hall

Ursinia geyeri L. Bolus et H. Hall, sp. nov.

Perennis, sat humilis, diffuse parceque ramosa; rami primarii cum aetate lignosi, 15—17 cm. longi, internodiis 5—10 mm. longis, ad 3 mm. diam.; ramuli ultimi floriferi 5—6 cm. longi; partes herbaceae novellae dense cinereo tomentosae, tomento cum aetate ± caduco; folia ascendentia, e basi amplectente pinnate vel 2-pinnate divisa, vel suprema integra, ad 2 cm. longa, manu complanata ad 1·3 cm. lata, segmentis obtusis, 1—8 mm. longis, ad 1 mm. latis; pedunculi 5 cm. longi; capitula ad 5 cm. diam. vel ultra; squamae involucri ca. 5-seriatae, omnes membranaceo marginatae, ad 8 mm. longae, paleae spathulatae, 6 mm. longae; ligulae emarginatae vel 2—3-denticulatae, laete rubrae, ad 2·5 cm. longae, 4—5 mm. latae; flores disci 6 mm. longi, segmentis atro purpureis, ca. 1·5 mm. longis; achenia 3 visa, clavata subfalcata, 4 mm. longa, squamis pappi 5, basi brunneis, aliter albis, prope apicem ad 5 mm. latis.

Cape Prov.: in dit Ceres; "on the farm Gansfontein, Ceres Karoo," ca. anno 1958, *A. L. Geyer.* N.B.G. 113/61. Fl. Jun.—Aug. 1961.

A dwarf perennial, diffusely branched herb with a fibrous root system and primary branches woody and very brittle with age, up to 17 cm. long, internodes 5—10 mm. long; leaves silvery grey-green when young, suffused with dull red with age and persistent long after becoming dry; ultimate flowering branchlets developing slowly from axils below the primary peduncle, the minute bud of the capitulum already visible in their earliest stage of growth; heads nodding when immature, held erect at maturity by day and nodding at night with the rays contiguous, for about 5 days before they droop and fade, finally, if mature fruits have been formed, becoming erect and fully exposing the 5 broadly white-winged fruits of the disc-flowers ready for wind-dispersal. The heads, 2 inches or more in diameter, with their glowing scarlet rays, expanding in winter sunshine, and almost black-purple disc-flowers are quite outstanding in this genus, where orange and yellow are the prevailing colours. According to Dr. Geyer the plants seen were not plentiful, "usually found under or in low hard-wooded bushes, sending up their new shoots so that the flowers top the shrubs. Now I find that without such support the new shoots lie almost flat on the ground, rather slovenly. They are eagerly nibbled by sheep and goats wherever they can reach them."

From his comments on the plants he is cultivating in Barrydale and from our more limited observations at Kirstenbosch, this species is evidently slow-growing, requires a well-drained soil and limited watering. It has been successfully propagated by cuttings, but these are rather slow in rooting. It is hoped the few fruits being produced will show quicker results, since this very striking additional colour to the genus shows great horticultural promise.

NOTES ON MESEMBRYANTHEMUM AND ALLIED GENERA

By H. M. L. Bolus

Cephalophyllum artum L. Bol. sp. nov.—Planta 1 visa, compacta, cum floribus 12 cm. alta, primum ca. 15 cm. diam.; rami primarii arti decumbentes, interdum reptantes, feri 4—6 cm. longi, internodiis inclusis, culti ad 11 cm. longi, internodiis 1—2 cm. longis, ad 5 mm. diam.; ramuli ultimi 4—6-foliati; folia fere erecta, demum subpatentia, supra visa acuta vel acuminata, plana vel prope apicem convexula, dorso lateribusque convexis, vel novella interdum carinata, lat. visa prope apicem leviter angustata, acuta vel obtusa, levia politaque, 3—5 cm. longa, medio 5—9 mm. lata diametroque, vagina ad 8 mm. longa, pari secundo interdum primo longiore sed multo graciliore; flores 1—2-nati, feri 5—6·5 cm. diam., culti minores; pedunculi leviter intrusi, 3·5—5 cm. longi, basi bracteati, bracteis lat. visis acutis vel obtusis, 1·5—2 cm. longis, vagina ventricosa, 4—5 mm. longa; receptaculum breviter crateriforme, 2—3 mm. longum, 7—9 mm. diam.; sepala 5, exteriora superne incrassata obtuseque compressa, in flore maximo 7 mm. longa, basi 6—8 mm. lata, interiora 7—8 mm. longa, basi 5 mm. lata, apice brevissime subulata, ample marginata, marginibus crebre brunneo maculata; petala 2—3-seriata, parum inaequilonga, e supra medium inferne angustata interdumque subspathulata, apice saepius rotundata, laetissime purpureorosea, ad 3 cm., vel ad 2·2 cm., vel ad 1·9 cm., longa, 2—3 mm. lata; filamenta 3—4 seriata, rosea, ad 4 mm. longa, papillis brevissimis pallidis, antheris brunneis, polline roseobrunneo; ovarium e disco abrupte ad 2·5 mm. elevatum, lobis approximatis, dorso complanatis, prope apicem tantum compressis obtusisque; stigmata 10—13, subulata fimbriata, 4—5 mm. longa.

Cape Prov.: "Ceres Karoo, 15 m. N. of Karoo Poort on the road to Calvinia," July 1959, *H. Hall* 1742.

N.B.G. 508/59. Fl. Jul. 1961.

Cephalophyllum stayneri L. Bol. sp. nov.—Planta 1 visa, compacta fera, ad 32 cm. diam.; rami reptantes, ad 22 cm. elongati, internodiis saepius 2—3 cm. longis, ad 4 mm. diam., latere altero complanato, cum aetate anguste alato; ramuli ultimi erecti, saepius 6-foliati, internodiis inclusis; folia erecta vel ascendentia, supra complanata linearia, prope apicem leviter angustata, acuta, dorso rotundata, lateribus convexis, lat. visa apice vix angustata, obtusa, matura rarissime ad 5 cm., saepius 3—4 cm., infima ad 2 cm., longa cum vagina ad 3 mm. longa, medio 5—6 mm. lata diametroque; flores 1—2-nati, ad 5·4 cm. diam.; pedunculi

1—3·5 cm. longi, basi vel parum supra bracteati (internodio inter folia et bracteas incluso vel cum aetate ad 1·2 cm. longo), bracteis 8—20 mm. longis cum vagina 2—4 mm. longa; receptaculum subcrateriforme, 3—4 mm. longum, 7—8 mm. diam.; sepala 5, matura saepius saturate rubra, exteriora e parum supra medium leviter incrassata angustataque, acuta, interiora obtusa, brevissime subulata, 8—10 mm., vel in flore altero 9—11 mm., longa, basi 4—5 mm. lata; petala ca. 6-seriata, exteriora 3-seriata, e parum supra medium inferne angustata, apice rotundata vel rarius emarginata, interiora perpauca, conspicue emarginata, supra nitentissima, cupreo rubra (red burnished with copper), infra minus nitentia distincteque vittata, pallidiora, 8—24 mm. longa, 1—2·5 mm. lata; stamina expansa 1·1 cm. diam., filamentis ca. 4-seriata, laete luteis, antheris pollineque pallidiore luteis; ovarium e disco gradatim vix ad 1 mm. elevatum, nitente tuberculatum, lobis approximatis obtuseque compressis; stigmata 10, subulata, demum fimbriata, 2·5—3 mm. longa.

Cape Prov.: in dit. Calvinia; Hantam River, Aug. 1961, *F. J. Stayner.* Karoo Garden 468/61.

Mr. Stayner writes: "Quite a remarkably beautiful range of colours exists in this species—cream, yellow, bronze, pink, mauve and orange".

Cephalophyllum pallens L. Bol. sp. nov.—Planta 1 visa quae ca. sex annorum est, ut videtur, compacta, 13 cm. alta, 17 cm. diam., caule 1·2 cm. diam.; rami primarii decumbentes, non radicantes, mortui 6—8 cm., hornotini ad 9 cm., longi, 4—8 mm. diam., internodiis 3—15 mm. longis; ramuli ultimi 4—6-foliati, internodiis inclusis; folia fere erecta vel alterum paris subfalcatum, supra plana vel superne leviter convexa, prope apicem angustata, subacuta, dorso lateribusque convexis vel prope apicem obscure carinata, lat. visa prope apicem leviter angustata, obtusa, levia, pallide subglauce viridia, vel novella viridia, adulta 5—9·5 cm. longa, medio 5—7 mm. lata diametroque, vagina ad 7 mm. longa; flores 1—3-nati vel irregulariter 2-ternati; pedunculi gradatim in receptaculum transeuntes, ad 2·7 cm., fructiferi ad 3·7 cm., longi, laterales prope basim bracteati, bracteis carinatis, lat. visis abrupte acutis, lateribus convexis, 1—1·4 cm. longis, ad 3 mm. diam., vagina ad 5 mm. longa; receptaculum primo subobconicum vel fere semiglobosum, 4 mm. longum, 8 mm. diam., in fructu immaturo crateriforme, 1·3 cm. diam.; sepala 5, acuta, extima in dimidio inferiore plana, in superiore angustata subcompressaque interiora apice breviter subulata, 7—9 mm. longa, basi 5—6 mm. lata; petala 2-seriata, inferne e prope medium leviter angustata, obtusa lutea, infra rubre suffusa, supra prope apicem rubra, 1·8—2·1 cm. longa, 2—2·75 mm. lata; filamenta ca. 4-seriata, pallida vel citrina, ad 6 mm. longa, antheris pollineque pallide luteis, papillis albis; ovarium circa marginem planum, lobis erectis obtusis, nitente tuberculatis, obtuse profundeque compressis, ad 2 mm. elevatis; stigmata 9—10, subulata, conspicue fimbriata, pallide viridia, ad 5 mm. longa; capsulae anni prioris infra semiglobosae, ad 5 mm. longae, supra ad 3 mm. elevatae, suturis compressis ringentibusque, ad 1·1 cm., expansae ad 2 cm., diam.

South-West Africa: "5 miles N. of Sendelings Drift", Mart. 1960, *H. Hall* 1870.

N.B.G. 176/60. Fl. 17.7.1961.

Cephalophyllum calvinianum L. Bol. sp. nov.—Planta 1 visa, fera compacta, ad 12 cm. diam., caule 1 cm. diam.; rami primarii 3—5 cm. longi, 6—7 mm. diam.; internodiis inclusis, 5—20 mm. longis; partes herbaceae leves, glauce virides; folia ascendentia vel inferne subfalcata deinde erecta, supra plana, linearia acuta, dorso rotundata vel sat obscure carinata, lateribus convexulis, lat. visa prope apicem angustata, acuta, breviter molliterque apiculata, saepius 5—6 cm. longa, medio ad 5 mm. lata diametroque; flores solitarii, 4·4 cm. diam.; pedunculi ad 7 cm. longi, basi bracteati, bracteis sat inconspicue carinatis, ad 4·5 cm. longis cum vagina 3—5 mm. longa; receptaculum obconicum, in pedunculum gradatim transeuns, 5 mm. longum, ad 7 mm. diam.; sepala 5, exteriora e infra medium subulate acuminata, ad 1·3 cm., interiora 5—8 mm., longa, basi 3—5 mm. lata, membranis amplis; petala 3—4-seriata, interiora perpauca, sublaxa, inferne e supra medium sat conspicue angustata, saepius emarginata vel profunde 2-dentata, purpureo rosea, sat inconspicue vittata, 7—19 mm. longa, 1·5—2 mm. lata; stamina expansa 1·8 cm. diam., filamentis 4-seriatis, pallide vel saturate roseis, ad 7 mm. longis, antheris pollineque albidis; discus crebre crenulatus; ovarium ca. marginem complanatum, deinde ad 1·5 mm. elevatum, lobis inferne complanatis, deinde leviter compressis, apice rotundatis; stigmata 10, gracilia, e prope basim superne attenuata, albida, breviter papillata, 6·5 mm. longa.

Cape Prov.: in dit. Calvinia; Hantam. Fl. Aug. 1961. *F. J. Stayner.* Karoo Garden. N.B.G. 475/61.

Pherolobus maughanii N. E. Br. var. **stayneri** L. Bol. var. nov.—Plantae visae ad 15 cm. diam.; folia adulta saepe late spathulata, utrimque grosse papillata, ungue basi 5 mm. lata, lamina fere circulari, 2 cm. vel ultra lata; petala saepissime acuta, in alabastro maturo lutea, in flore maturo inferne albida, apicem versus pallidiore lutea, demum fere omnino albida, marcescentia fere rubra, ad 4 mm., saepius 2—3 mm., lata.

Cape Province: in dit. Calvinia; Hantam, Jul.—Aug. 1961, *F. J. Stayner.* Karoo Garden 448/61.

Mr. Stayner's collection of this beautiful annual is the third to be recorded—all from the same locality. The previous one, made in October

1949 by M. R. Levyns, was cited in our "Notes" (Vol. III : 231), and the type was described in 1928. In both the latter the petals were stated to be rose or pale rose. In this variety the petals are a rich butter-yellow on both surfaces in the mature bud and first expansion of the flowers, becoming paler from below upwards until finally the entire petal is a creamy white; the filaments are bright red and the rounded tips of the 5 lobes (alternating with the stigmas) shine like rubies immersed in a setting of the anthers, which vary in colour from dark red to red according to age. (A very small "looper" caterpillar was observed on one of the lobes and two of the others in the same flower appeared to have been despoiled.) The largest flower seen was 5·4 cm. in diameter. No mature fruit is yet available for description.

Mr. Stayner writes: "We camped in a field of Pherolobus on cleared ground below the Calvinia town dam, and they extended from Blaauwkrantz pass (Boskloof) up the sides of the Hantamberg to an altitude of 4,500 feet. It was associated with Dorotheanthus apetalus, which I have also seen associated with other species of this genus, but have not observed any hybridization. Its mimicry of the other species of Dorotheanthus is perfect."

Dorotheanthus stayneri L. Bol. sp. nov.—Plantae vivae juveniles tantum visae, cum floribus ad 4 cm. altae, 3—5 cm. diam.; partes herbaceae rubescentes vel rubrae; folia anguste spathulata, ad 2 cm. longa, ad 6 mm. lata; pedunculi ad 2 cm. longi; receptaculum obconicum, ad 3·5 mm. longum, ad 6 mm. diam.; sepala subaequilonga obtusa, in flore maximo ad 9 mm., in ceteris 6—7 mm., longa, basi ad 4 mm. lata; petala 2-seriata, e medio vel infra inferne angustata, obtusa vel emarginata, purpureo rosea vel inferne pallidiora vel alba oculumque formantia, immo basi rubra, in flore maximo 2·2—2·5 cm. longa, ad 3 mm. lata; stamina ca. 4-seriata, aurea, primum prope basim leviter constricta incumbentiaque, deinde erecta, ad 3 mm. longa, intima basi luteo papillata; ovarium supra concavum; stigmata late patentia, fimbriata, ad 2 mm., vel in flore marcescente 3 mm., longa.

Cape Prov.: in dit. Worcester; Matroosberg Station, *F. J. Stayner.* Karoo Garden 502/61. Fl. Aug. 1961. Typus. Tweedside, Sept. 1932, *W. F. Barker* 8594; on the farm "Avondrust", 4 miles E. of Touws River, Sept. 1959, *R. C. Littlewood.* Karoo Garden 513/59.

Dorotheanthus littlewoodii L. Bol. sp. nov.—Plantae vivae plures visae, cum floribus ad 12 cm. diam.; folia spathulata, ad 5·5 cm. longa, unque basi dilatato rubroque, lamina apice rotundata vel obtusa, oblonga vel ovalis vel rarius fere circularis, adulta 9—15 mm. lata; flores demum ad 2·5 cm. diam.; pedunculi rubescentes, ad 5 cm. longi; receptaculum

saepius brevissime crateriforme, 1·5—2 mm. longum, ad 6 mm. diam. sepala 5—8 mm., vel in flore marcescente ad 11 mm., longa, basi ad 4 mm. lata; petala 1—2-seriata, inferne leviter angustata, obtusa, inferne alba, superne pulchre rosea, utrimque saturatiore vittata, vittis conspicuoribus in dimidio inferiore, ad 1·3 cm. longa, 0·5—1 mm. lata, angustissima in genere visa; filamenta 3—4-seriata, diu incumbentia, interiora prope medium papillata, papillis pallidis, inferne pallida, superne rubra, ad 3 mm. longa, antheris pollineque laete luteis; ovarium circa marginem concavum vel planum, deinde ad 1 mm. elevatum, lobis dorso complanatis; stigmata 5, profunde posita, angustissime subulata, 1·5 mm., vel in floribus senectis 2 mm., vel in fructu immaturo ad 4 mm., longa.

Cape Prov.: in dit. Worcester; "6 miles W. of National Road turn-off to Ceres, 12 miles W. of Worcester," Sept. 1960, *R. C. Littlewood.* Karoo Garden 630/60. Fl. Aug. 1961.

Ruschia pauper L. Bol. sp. nov.—Rami feri plures visi, subrigidi glabri, aliter partes herbaceae velutinae ob papillas capillares minutas, cum aetate glabrescentes, ad 10 cm. longi, internodiis 1—2·5 cm. longis, ad 3 mm. diam.; ramuli floriferi saepius 2-foliati; folia sat diversiformia, diu fere erecta, demum fere patentibus, interdum inferne falcata, supra visa linearia prope apicem angustata, acuta vel interdum adulta breviora oblonga, apice rotundata, lat. visa ex infra medium superne ampliata, apice rotundata vel subtruncata, carinata, lateribus convexis, minute tuberculata, in siccis tuberculis prominentibus, sordide viridia, 1—3·5 cm. longa, vagina 1·5 mm. longa, medio 5—7 mm. lata, prope apicem 6—11 mm. diam.; flores pauperes, 3-nati vel demum, ut videtur, 2-ternati; pedunculi 5—8 mm., fructiferi ad 15 mm., longi, laterales parum infra medium bracteati, bracteis membranaceo marginatis, 3—6 mm. longis; receptaculum obconicum, ad 2·5 mm. longum, ad 3 mm. diam.; sepala 5, acuta vel extima interdum acuminata, 3—4 mm. longa, basi 1·5—3 mm. lata; petala 2-seriata, inferne leviter angustata, obtusa, rosea, 3—4 mm. longa, ad 0·5 mm. lata; staminodia non visa (? nulla); stamina non bene visa, ca. 4-seriata, filamentis albis, intimis prope apicem papillatis, ad 3 mm. longis, antheris pollineque luteis; discus crenulatus; ovarii lobi subapproximati, obtuse compressi, leviter elevati; stigmata 5, non bene visa; capsula ad 5 mm. longa, infra obconica, 2 mm. longa, supra ad 6 mm., expansa 10 mm., diam., suturis valde compressis, valvis late patentibus, textura tenui, carinis dimidium valvae attingentibus, aristis nullis, inferne parallelis distantibusque, superne leviter divergentibus, tuberculo magno obovato pallido.

Cape Prov.: Namaqualand; "4 miles S.E. of Jakkalswater, Maio 1961, *R. C. Littlewood.* Karoo Garden 211/61.

Ruschia deminuta L. Bol. sp. nov. (*Uncinata*).—Plantae ferae plures visae, arte compactae, subsemiglobosae glabrae, copiose ramuliferae, caule senecto ad 6 mm. diam.; folia dense imbricata, supra ovata, plana vel concava, levia carinata, carina marginibusque cartilagineis, parce muricatis, lateribus convexis, crebre muricatis, lat. visa semiovata, apice subrotundata, pallide glauce viridia, 3—5 mm. longa, 3—4 mm. lata diametroque, vagina ca. 1 mm. longa; pedunculi in bracteis inclusi vel breviter exserti, 1·5—2 mm., fructiferi ad 5 mm., longi; receptaculum obconicum, in pedunculum gradatim transeuns, 1·5—2 mm. longum, ad 4 mm. diam.; sepala 5, omnia ± ample marginata, muricata, 2·5—3 mm. longa, basi 1—2 mm. lata; petala ca. 3-seriata, inferne vix angustata, obtusa, pallidissime rosea, ad 6 mm. longa, ad 0·5 mm. lata; staminodia stamina conferta subaequantia; filamenta ca. 4-seriata, ad 3 mm. longa, interiora infra medium papillata, antheris pollineque luteis; ovarii lobi fere globosi, sat distantes, altitudinem disci leviter excedentes; stigmata 5, gracilia, e infra medium superne attenuata, ad 4 mm. longa; capsula infra obconica, ad 2·5 mm. longa, ad 5 mm., expansa 8 mm., diam., supra per 1·5 mm. elevata, suturis valde compressis.

South-West Africa: prope Aus, "on the farm Plateau at the summit of the plateau," Mart. 1960, *H. Hall* 1847. Fl. Nov. 1960. N.B.G. 563/60.

R. muricatae valde affinis fortasseque forma deminutissima.

Ruschia stayneri L. Bol. sp. nov. (Microphylla).—Plantae 3 visae, glabrae—prima caespitosa, cum floribus 4·5 cm. alta, 6 cm. et 7·5 cm. diam., caule 1·3 cm. diam.; rami primarii ad 5 mm. diam., internodiis inclusis; ramuli inferne reliquiis vaginarum imbricatis vestiti, ultimi 4—8-foliati; folia 4—7 mm. longa; secunda 7·5 cm. alta, 5 cm. diam., caule 6 mm. diam.; rami primarii ad 3 mm. diam., internodiis inclusis vel ad 1·6 cm. longis; tertia 22 cm. alta, 11 cm. diam., caule 1·1 cm. diam.; rami primarii senectissimi erecti lignosi rigidi, internodiis 1—2·5 cm. longis; ramuli hornotini herbacei steriles ad 16-foliati, ad 18 cm. longi, internodiis 6—20 mm. longis; ramuli floriferi 4—6-foliati; partes herbaceae tactu subvelutinae, demum politae, juniores virides; folia ascendentia vel in ramulis novellis diu erecta, supra plana, lanceolata vel linearia, acuta vel acuminata, acute carinata, lat. visa superne angustata, acuta, apice saepe subrecurva, apiculo minuto vel in novellis ad 1 mm. longo, 5—15 mm. longa, medio breviora ad 5 mm., longiora 1·5—3 mm., lata diametroque, vagina 2—3 mm., vel in foliis floribus subtendentibus ad 6 mm., longa; flores 2—2·5 cm. diam.; pedunculi 5—10 mm. longi; receptaculum subglobose obconicum, 2—3 mm. longum, 4—5 mm. diam.; sepala 5, e prope basim superne angustata, acuta vel acuminata, apiculata, 5—6 mm., vel in flore altero 6—7 mm., longa, basi 1·5—4 mm. lata; petala 3—4-seriata, inferne non, vel infra medium leviter, angustata, obtusa vel acuta, purpureo rosea, 6—10 mm. longa, 0·5—1 mm. lata; staminodia roseo purpurea, stamina conferta aequantia vel bene excedentia; filamenta ca. 5-seriata, prope basim pallida, aliter roseo purpurea, ad 4 mm. longa, interiora infra medium papillata, antheris pollineque albis; ovarii lobi obtuse compressi, subdistantes, ad 0·75 mm. elevati; stigmata 5, gracilia, interdum sordide purpurea, 3—4 mm. longa.

Cape Prov.: in dit. Calvinia; Hantamberg, Jul. 1961, *F. J. Stayner.* Karoo Garden 450/61.

Mr. Stayner writes: "This is quite common above Calvinia. We saw it growing with *Pherolobus* at 4,500 feet altitude, unfortunately badly eaten. It flowers very densely indeed and will be a welcome addition to our flowering plants".

The long sterile branches of the year's long shoots are usually produced from near the base of the plant, and bear several closely imbricating sheathing remains at their base.

Lampranthus microsepalus L. Bol. sp. nov. (*Scabridi*).—Rami plures visi, 9—18 cm. longi, ad 3 mm. diam., internodiis saepius 1—2 cm. longis; folia in ramulis diu fere erecta, demum late ascendentia, prope apicem interdum recurva, obtuse carinata, lat. visa superne interdum leviter ampliata, apice oblique truncata vel obtusa vel rarius acuta, 8—10 mm. longa, 1—1·5 mm. diam.; flores solitarii, ad 2·2 cm. diam.; pedunculi 1—1·5 cm. longi; receptaculum obconicum, 2·5 mm. longum, ad 4 mm. diam.; sepala 5, subaequilonga, superne acuminate subulata, interioribus ample atro brunneo marginata, 3—3·5 mm., vel in alabastro ad 4 mm., longa, vel in floribus maturis exteriora interioribus interdum breviora, basi 2—3 mm. lata; petala sat laxe 2—3-seriata, inferne angustata, saepius obtusa vel rarius emarginata, rosea, marginibus saturatioribus, in flore maximo 8—10 mm. longa; staminodia antheras abortivas interdum ferentia, staminibus conice confertis appressa eisque breviora vel subaequilonga; filamenta 3-seriata rosea, ad 3·5 mm. longa, exteriora inferne longe papillata, intima medio papillata, antheris pollineque pallide luteis; discus inconspicuus, obscure crenulatus; ovarium e margine sat abrupte ad 1·5 mm. elevatum, lobis dorso complanatis; stigmata 5, gracilia, e medio superne attenuata, ad 3 mm. longa.

Cape Prov.: in dit. Tulbagh; Kleinberg, prope Tulbagh, Jul. 1928, *A. V. Duthie* (S.U.G. 1410—typus). Fl. Jun. 1938. Prope Worcester, Sept. 1928, *L. Verwoerd* (S.U.G. 1478). Fl. Aug. 1938.

Lampranthus paarlensis L. Bol. sp. nov. (*Scabridi*).—Planta 1 visa, 46 cm. alta (fortasse inter frutices orta itaque elongata), diffuse ramosa;

caule rigido in sectione, basi 5 mm. diam.; rami primarii brunnei, demum politi, 10—12 cm. longi, internodiis saepius ad 2 cm. longis, ad 2 mm. diam.; folia inter gracillima in sectione, saepe 1·8—2·2 cm. longa, vagina ad 1·5 mm. longa, medio ad 1·5 mm. lata diametroque, carinata, lat. visa e basi ad 2 mm. diam. superne gradatim angustata, acuta, viridia, inconspicue scaberula; flores solitarii, 3 cm. diam.; pedunculi graciles, 1·5—2·8 cm. longi; receptaculum globose obconicum, 3 mm. longum, ad 6 mm. diam.; sepala 5, omnia superne subulata, interioribus anguste atro brunneo marginata, 5 mm., vel in flore altero 5—6 mm., longa, basi 2·5—4 mm. lata; petala ca. 2-seriata, e medio vel infra inferne angustata, obtusa vel subacuta, pulchre rosea vel fere alba, 1—1·3 cm. longa, ad 1·5 mm. lata; staminodia staminibus conice confertis appressa eisque subaequilonga, dimidio inferiore albo, superiore rubra; filamenta ca. 4-seriata, interiora prope medium papillata, supra papillas rubra, antheris pollineque luteis; dimidium exterius ovarii fere planum, interius ad 0·5 mm. elevatum; stigmata 5, anguste subulata, 1·5 mm. longa.

Cape Province; in dit. Paarl; Daljosaphat, Aug. 1937, *A. J. Middlemost* (N.B.G. 1360/37). Typus.

Forma culta.—Flores ad 4 cm. diam.; petala ad 2 mm. lata; ovarium ad 1 mm. elevatum; stigmata ad 3·5 mm. longa.

Prope Wellington, "on the road to Hermon", Sept. 1932, L. Bolus (Bolus Herb. 20163). Fl. hort. L. Bolus Sept. 1934.

A. L. Grant 2398 (Aug. 1926) et 5060 (Aug. 1929), "near Wellington", haec species sunt, ut videtur. "Petala alba."

The specific name refers to all the collections recorded having been made in the Paarl Division.

Lampranthus virgatus L. Bol. sp. nov. (*Scabridi*).—Plantae 2 visae, ad 43 cm. altae, caule ad 5 mm. diam.; rami primarii fere erecti, virgati brunnei, demum politi, ad 28 cm. longi, internodiis 2·5—4 cm., saepius 3 cm., longis, ramulis lateralibus brevibus, nondum evolutis, dense foliatis; folia inter gracillima in sectione, ascendentia, supra et lateraliter visa linearia acuta, carinata, saepe breviter apiculata, viridia, inconspicue scaberula, primaria 2—2·3 cm. longa, 1—1·5 mm. lata diametroque; flores solitarii vel 2—3-nati, ad 3·4 cm. diam.; pedunculi 2·5—5·5 cm. longi; receptaculum breviter obconicum, 2·5 mm. longum, ad 5 mm. diam.; sepala 5, subaequilonga, omnia superne acute vel acuminate subulata, ad 5 mm. longa, basi 3—4 mm. lata, interiora atro brunneo marginata; petala ca. 3-seriata, brevissima perpauca, e medio, vel infra, inferne angustata, obtusa, pulchre rosea, basi saturatiora, ad 1·4 cm. longa, ad 1·5 mm. lata; staminodia non bene visa, in siccis, ut videtur, staminibus breviora; filamenta 3—4-seriata, exteriora inferne

dense longeque papillata, intima supra medium papillata, ad 3 mm. longa; discus distanter profundeque crenulatus; ovarium circa marginem planum, deinde ad 0·75 mm. elevatum, lobis leviter compressis vel dorso fere complanatis; stigmata 5, anguste subulata, conspicue superne attenuata, ad 2 mm. longa.

Cape Prov.: in dit. Clanwilliam, "a mile from Alpha on the road to Algeria," Sept. 1938, *L. Bolus* (Bolus Herb. 27,100).

The genus **Cheiridopsis,** containing upwards of 90 species, appears to be confined almost entirely to the western part of the Cape Province, the most easterly station being in the Laingsburg Division (**C. cigarettifera**) and the most southerly in the Malmesbury Division (**C. purpurascens**). The great majority occur in Namaqualand. Rather many of the species are insufficiently known and an intensive study of the genus with ample material representing the various stages in the growth of the plant, as well as the modifications resulting from cultivation, will probably reduce the number of the existing ones. On the other hand, with the more intensive collecting of these days there is every prospect of additional new discoveries. The genus is most closely allied to **Cephalophyllum,** and there seem to be border-line species, the *almost* infallible distinction being the limitation in the number of the foliage-leaves (apart from the bracts) on the *flowering branchlet*—one pair in most of the species and rarely more than two pairs in the few exceptional ones. It may be divided roughly into 6 groups based entirely upon vegetative characters, the largest group by far being the "sleeved" ones (*cheiris* = sleeve, *opsis* = appearance). The following key may serve to indicate the main distinctions.

Key to the Species

1. Branches with ± elongated internodes—e.g. *C. aspera*, *C. pilosula* . . . . ELONGATAE
1. Branches with internodes enclosed in the leaf-sheaths, or sometimes exserted in cultivation.
    2. Flowering branchlets 4-leaved—e.g. *C. bibracteata*, *C. turbinata* . . . . BIBRACTEATAE.
    2. Flowering branchlets 2-leaved.
        3. Leaves turgidly succulent—e.g. *C. pillansii*, *C. crassa* . . . . TURGIDAE
        3. Leaves not turgidly succulent.
            4. Leaf pairs similar in form, ± hardening with age and not forming "sleeves".
                5. Leaves rather soft and succulent, entire, rather short—e.g. *C. cuprea*, *C. speciosa* . . . . CUPREAE.
                5. Leaves rather hard, sometimes dentate, often pallid and among the largest leaves in the genus—e.g. *C. candidissima*, *C. dentata* . . . . . . GRANDES.
            4. Leaf-pairs dissimilar in that the sheath in the lower pair is shorter than in the upper which forms the "sleeves"—e.g. *C. tuberculata*, *C. peculiaris* . . . . EUCHEIRIDOPSIS.

The following collections of **Cheiridopsis** which have flowered recently in the Karoo Garden appear to have been considerably modified by cultivation and are probably:

C. aspera L. Bol. (*Elongatae*) with the branches up to 1 cm. in diameter; one pair of leaves 6·5 cm. long, 1·5 cm. in diameter, another pair up to 8 cm. long, 7 mm. in diameter; petals up to 3 cm. long. Locality and collector unknown. K.G. 192/59. Fl. Aug. 1959.

C. turbinata L. Bol. (*Bibracteatae*). A fine plant 23 cm. in diameter; the lower leaves with very convex sides, up to 12 cm. long, ad 2·2 cm. in diameter; petals up to 3·7 cm. long.

Namaqualand; "10 miles N.E. of Bitterfontein," *R. C. Littlewood.* K.G. 226/60. Fl. 21.7.61. This extends the range of distribution and is the most southerly station recorded for this species.

NOTE.—We are indebted to Mr. G. D. Rowley for drawing our attention to the fact that the generic name **Maughania** N. E. Br. is invalid, being a later homonym of **Maughania** used validly by Jaume Saint-Hilaire in 1813. A new name is therefore required for it and **Maughaniella** is suggested on account of its small size.

Maughaniella L. Bol. nom. nov. vice *Maughania* N. E. Br., Journ. Cact. and Succ. Soc. of America, II : 389 (1931), nec J. St.-Hil., Nouv. Bull. Soc. Philomatique, Paris, 3 : 216 (1813).

M. luckhoffii (N. E. Br.) L. Bol., comb. nov.

Cheiridopsis littlewoodii L. Bol. sp. nov. (*Bibracteata*).—Planta 1 visa, robusta, 15 cm. diam., caule 1·3 cm. diam.; ramuli 6-foliati, in sterilibus foliis supremis interdum nondum bene evolutis; partes herbaceae minute velutino pubescentes, glauco virides; folia supra plana, superne e medio angustata, sat conspicue rubre apiculata, primo lateraliter compressa acuteque carinata, carina interdum prope apicem 1—4 denticulata, cum aetate dorso rotundata, lat. visa non, vel leviter, angustata vel interdum leviter ampliata, obtusa vel rotundata vel oblique truncata, pari infimo 4—5 cm., medio 6—7 cm., supremo nondum evoluto ad 6 cm., longo, vagina purpureo rosea, ad 2 cm. longa; ramulus floriferus 1 visus, sine vagina folia infima 5·5 cm., media 6 cm., suprema 7·5 cm., longa; pedunculus in receptaculum globose obconicum, 7 mm. longum, 13 mm. diam., gradatim transeuns, 4 cm. longus, 5—7 mm. diam.; bracteae basales, 3·3 et 3·6 cm. longae, 6 mm. et 7 mm. diam.; sepala 5, 1·1—1·3 cm. longa, basi 7—15 mm. lata, exteriora superne carinata, apice acute subulata, anguste marginata, intima apice obtuse subulata, late mar-

ginata; petala dense 6—7-seriata, exteriora inferne leviter angustata acuta vel obtusa, supra pallidissime cupreo lutea, infra pallidissime cupreo rosea, 2—3 cm. longa, 1—1·5 mm. lata; filamenta ca. 4-seriata, alba, ad 6 mm. longa, antheris pollineque stramineis; ovarium supra planum; stigmata 18, matura late patentia, superne attenuata recurvaque, fere ad 4 mm. longa.

Cape Prov.: in dit. Vanrhynsdorp; "21 miles on the Kliprand turn-off on the Vanrhynsdorp–Bitterfontein road," May 1960, *R. C. Littlewood.* Karoo Garden 405/60. Fl. Aug. 1961.

This plant is remarkable in having 3 pairs of leaves in the flowering branchlet, a number not hitherto recorded in **Cheiridopsis.** It is therefore anomalous in this section, and it is placed here tentatively until more material is available to prove this an exceptional occurrence. The number of the stigmas is also unusual, as it is in **C. candidissima** where 17—19 are recorded, 10 being the usual number.

NOTE.—The type specimens of all new species and new varieties described in this paper are in the Bolus Herbarium, University of Cape Town, Rondebosch.

(*To be continued.*)

A NEW ERICA FROM THE VILLIERSDORP AREA

By Col. H. A. Baker, O.B.E., M.C.

Erica umbrosa H. A. Baker sp. nov. (Ericaceae-Ericoidae) Ephebus.

Fruticulus umbrosus erectus, nonnihil viscosus, fere 50 cm. altus. *Rami* aliquantum graciles, juniores villosi, pilis paucis glanduliferis admixtis. *Folia* 4-nata angusta, 4—6 mm. longa, superiora imbricata, inferiora disjunctiora et divaricata, plus minusve dorso aperto marginibus recurvis, ciliata pilis paucis longis rigidis glanduliferis in duobus ordinibus dispositis, infra et in marginibus puberula. *Inflorescentia* terminalis umbellate 2—12-flora. *Pedunculi* 7 mm. longi, pubigeri, pilis paucis glanduliferis admixtis; bracteae 3, frondosae, inferior remota, superiores diverse approximatae et minores et sicut sepala ciliatae pilis rigidis glanduliferis et pubigerae. *Sepala* anguste ovata attenuata rubella tenuia, 3 mm. longa, nervo medio et in parte superiore marginibus recurvis. *Corolla* globosa fere 6 mm. longa, rubicunda pubescens sicca, lobis parvis erectis vel divaricatis, 1·2 mm. longis. *Filamenta* basalia, superne sigmoidea: antherae exsertae, subterminales oblongae scabrae, solute rubrae, 1·2 mm. longae, bilobatae, basi curvatae prognatae, aristis 0·5—0·7 mm. longis scabridis, basin versus affixis, poro fere dimidio lobi aequali. *Ovarium* globoso-obovatum, hispidulum; stylus sursum versus leviter angustans exsertus, stigma parvum, capitatum.

An erect, shade-loving, somewhat sticky shrublet, about 50 cm. high. *Branches* rather slender, the younger villous, with a few gland-tipped hairs admixed. *Leaves* 4-nate, narrow, 4—6 mm. long, the upper imbricate, the lower more distant and widely spreading, more or less open-backed with recurved margins, ciliate with a few long, stiff, gland-tipped hairs in two rows, puberulous beneath and on the margins. *Inflorescence* terminal, umbellately 2—12-flowered. *Peduncles* 7 mm. long, pubigerous, with a few gland-tipped hairs admixed: bracts 3, leaf-like, the lower remote, the upper variously approximate and smaller and, like the sepals, ciliate with gland-tipped hairs and pubigerous. *Sepals* narrowly ovate, attenuate, reddish, thin, 3 mm. long with a medial nerve and with recurved margins in the upper part. *Corolla* globose, about 6 mm. long, pink, pubescent, dry, the small lobes upright or slightly spreading, 1·2 mm. long. *Filaments* basal, sigmoid at the top: anthers exserted, subterminal, oblong, scabrid, dark red, 1·2 mm. long, bilobed, with a curved prognathous base, the scabrid awns 0·5—0·7 mm. long, attached near the base: pore about half the length of the cell. *Ovary* globose-obovate hispidulous; style tapering slightly upwards, exserted; stigma small, capitate.

CAPE PROVINCE: Caledon Division, Elands Kloof (N.W. of Villiersdorp) on the shady side near the waterfall, *Oliver* 1423 holotype in the Bolus Herbarium, *Baker* 1695, and Worcester Division, Goudini Sneeuwkop, *Esterhuizen* 29070. Flowers in summer.

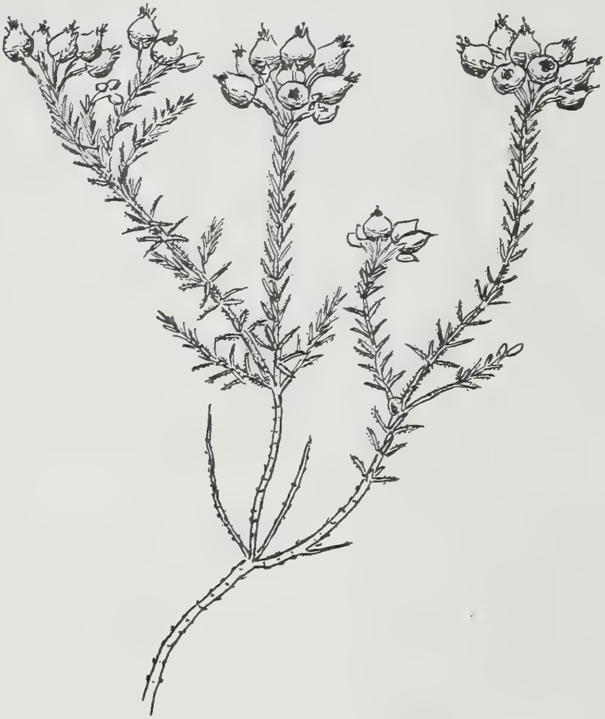

Fig. 1

FIG. 1: *Erica umbrosa* H. A. Baker (Natural Size) *Baker* 1695.
Del. H. A. Baker.

This species was first collected by *E. G. H. Oliver* in March 1960 on a steep, shady, rather damp kloof-side facing south near the waterfall in Elands Kloof, a valley surrounded by mountains and known locally as the four farms valley, near Villiersdorp. It appears to be confined to shady, rather damp places in this area and, where found, is fairly frequent but, owing to its requirement of shade, suitable areas are few and small. In Elands Kloof it grows in association with, inter alia, *Erica distorta* Bartl., *E. nudiflora* L., *E. cruenta* Soland, *E. coccinea* L. and *E. lateralis* Willd., but all these are also growing outside the shady area.

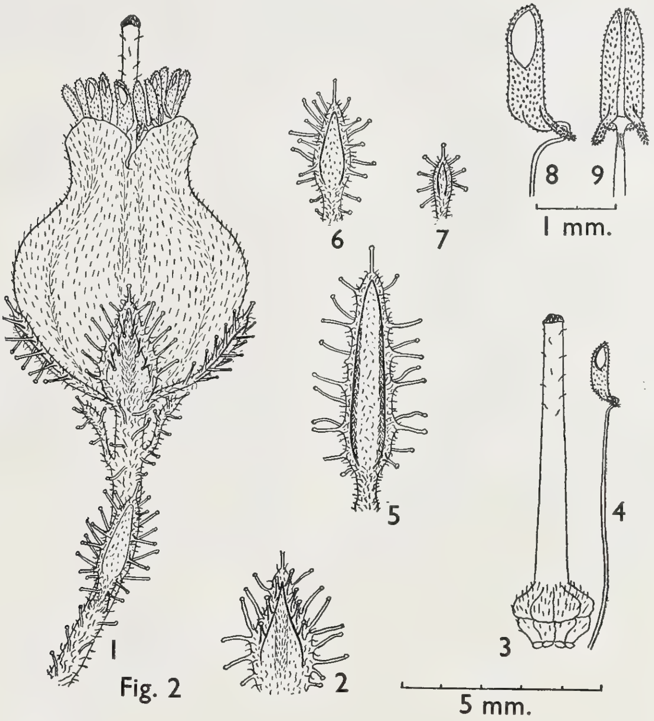

Fig. 2

Fig. 2: *Erica umbrosa* H. A. Baker 1 flower, 2 sepal, 3 gynoecium, 4 anther, 5 leaf, 6 and 7 bracts all x 5, 8 anther side view, 9 anther back view x 10. *Del.* E. G. Oliver.

The floral parts are somewhat variable in size according to their position in the umbel; the description above is of a fully developed flower. The corolla, whilst being truly globose at maturity, has four strong nerves which tend to make it look quadrangular later. *E. umbrosa* closely resembles *E. globosa* Andr. and has, therefore, been placed in the section Ephebus. It differs from *E. globosa* in the following respects: (*a*) The leaves are 4-nate, (*b*) the anthers are subterminal and quite differently shaped to those in *E. globosa*, (*c*) the inflorescence is always umbellate, whereas, in *E. globosa* it is 3-nate and also axial.

The author would like to thank those who have, by their encouragement and assistance, made this work possible. To Capt. T. M. Salter, R.N., for undertaking the Latin version and for correcting the manuscript; to the curators of the Bolus and Compton Herbaria for allowing him to use the facilities at their disposal and to Mr. E. G. H. Oliver for the enlarged drawings of floral detail.

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VIR PLANTKUNDE

SERVICE PRODUCTS
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[illegible] STREET
[illegible]